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ABSTRACT

The Early Childhood Longitudinal Study (ECLS-K), Kindergarten Class of 1998-99, sponsored by the U.S. Department of Education, National Center for Education Statistics, selected a nationally representative sample of kindergartners in the fall of 1998 and is following these children through the end of fifth grade. This report details findings from the ECLS-K for the base year 1998-99. Following an executive summary, introduction to the kindergarten year, description of the report's organization, and national data on kindergartners in the United States, the findings are presented in two sections, followed by a summary and a methodology and technical notes section. The first section of findings describes overall gains children made during the kindergarten year in reading and mathematics. Findings in this section are based on children's overall reading and mathematics scale scores. The second section of findings explores specific reading and mathematics knowledge and skills gained during the kindergarten year. This section also includes information about children's acquisition of various social skills over the school year. The two findings sections present information in three basic areas: (1) a description of the gains children made from fall to spring; (2) differences in gain by child, family, and program characteristics; and (3) differences in children's status in the spring. (Includes numerous data tables. Contains 18 references.) (EV)

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The Kindergarten Year

Findings from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–99

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We would also like to thank the 20,000 kindergarten children and their parents, and the more than 3,000 kindergarten teachers who participated during the base year of the study. We would like to thank the administrators of the schools we visited across the United States for allowing us to work with their children, teachers and parents, and for providing us with information about their schools. We are especially appreciative of the assistance we received from Chief State School Officers, district superintendents and staff, and private school officials.

Westat, Incorporated—in affiliation with the Institute for Social Research and the School of Education at the University of Michigan, and the Educational Testing Service, under the direction of the National Center for Education Statistics (NCES)—conducted the base-year study. We would like to express our appreciation for the efforts of the staff from each of these organizations, and especially to the more than 400 field staff who conducted the child assessments and parent interviews in fall 1998 and spring 1999.

We wish to acknowledge the support that we have received from the Head Start Bureau of the Administration on Children, Youth and Families; the Economic Research Service of the U.S. Department of Agriculture; the National Institute for Child Health and Human Development; and the U.S. Department of Education's Office of Special Education Programs, Office of Bilingual Education and Minority Languages Affairs, and Planning and Evaluation Service.

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A special thank you to Kendra Chandler Webb, age 9 (1994), for designing the ECLS logo, and to Westat for aiding in the design of the cover.

Executive Summary

The kindergarten year marks a period of rapid change in the ways children think about themselves and the world around them (Bredekamp and Copple 1997; Sameroff and McDonough 1994). This change is influenced by both developmental factors (e.g., age, maturation) and environmental factors (e.g., schooling, home educational activities, family resources). Across this first year of schooling, children will acquire the knowledge and skills that will prove integral to their future success in school and in life.

Children enter school demonstrating a vast array of knowledge and skills, some children further along than others (West, Denton, and Germino Hausken 2000). The kindergarten year serves multiple purposes and is geared toward the development of both cognitive and noncognitive knowledge and skills (Seefeldt 1990). And, depending on the child, knowledge and skills develop in different areas and at different rates across this year of school.

To enrich the picture of children's first experience in formal education—the kindergarten year—we need to understand the knowledge and skills children possess as they enter kindergarten and we need to gain insight into how these develop across the kindergarten year. This report attempts to answer two basic sets of questions about children's knowledge and skill acquisition during the kindergarten year.

1. What gains are children making from the fall of their kindergarten year to the spring of their kindergarten year in their reading and mathematics knowledge and skills? Do these gains differ by child, family, and kindergarten program characteristics? As children are exiting kindergarten and preparing for first grade, how do their knowledge and skills differ by child, family, and kindergarten program characteristics (e.g., age, family risk factors)?

2. What gains are children making in specific knowledge and skills (e.g., recognizing letters, recognizing numbers, paying attention)? Do children's gains in specific knowledge and skills differ by child, family, and kindergarten program characteristics? At the end of their kindergarten year when children are preparing for first grade, do their

specific knowledge and skills differ by child, family, and kindergarten program characteristics (e.g., age, mother's education)?

The findings in this report come from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K). The ECLS-K, sponsored by the U.S. Department of Education, National Center for Education Statistics (NCES), selected a nationally representative sample of kindergartners in the fall of 1998 and is following these children through the end of fifth grade. The full ECLS-K sample is comprised of approximately 22,000 children who attended about 1,000 kindergarten programs during the 1998–99 school year. The children attended both public (85 percent) and private (15 percent) kindergartens that offered full-day (55 percent) and part-day (45 percent) programs. All kindergarten children within the sampled schools were eligible for the sampling process, including language minority and special education students. The sample includes children from different racial/ethnic and socioeconomic backgrounds. In the fall of 1998, about 95 percent of kindergartners were entering school for the first time. This report focuses on these first-time kindergartners. When information on children's cognitive knowledge and skills is presented, this report focuses on the children in the sample who received the cognitive assessment in English in both the fall and the spring of their kindergarten year.[1]

Findings

Question 1: Gain, Differences in Gain, and Spring Kindergarten Status in Children's Knowledge and Skills

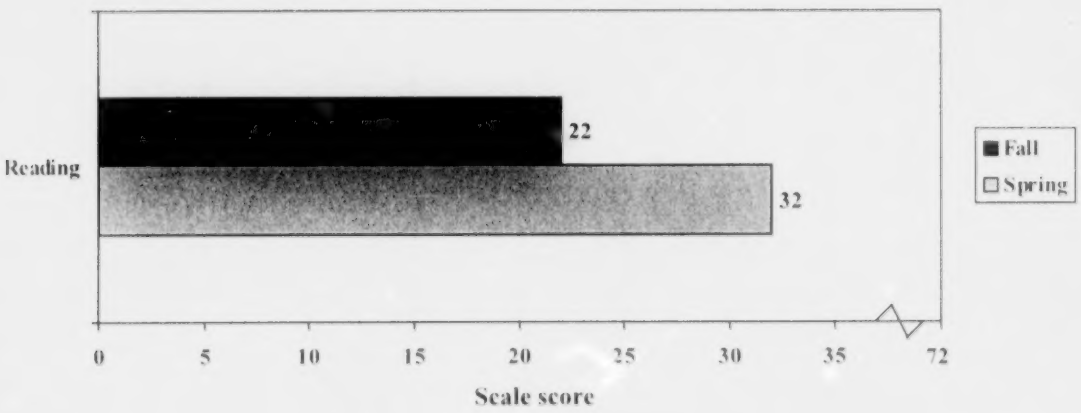
To address the first set of questions, the change from the fall of kindergarten to the spring of kindergarten in children's reading and mathematics scale scores was examined. These scores reflect children's overall performance in these domains. The possibility that particular groups of children might demonstrate more or less gain over the kindergarten was also explored

[1] Approximately 30 percent of Hispanic children and 19 percent of Asian children were not assessed in English and are not included in the estimates related to cognitive knowledge and skills. The Hispanic children who were proficient in Spanish were assessed in Spanish (for details see *Methodology and Technical Notes, Constructs, and Variables Used in Analysis*). The Hispanic and the Asian children not assessed in English are included in the estimates related to noncognitive knowledge and skills. And, due to specific instructions listed in the child's school record, about one-half percent of children were excluded from the cognitive assessment based on a disability.

(e.g., children at risk for later school difficulty might not acquire reading knowledge and skills at the same rate as children not at risk for later school difficulty).

As their kindergarten year comes to a close, children demonstrate higher levels of reading and mathematics knowledge and skills than they demonstrated as they entered school for the first time. Children's reading scale scores increased by 10 points from the fall to the spring (figure A). Therefore, the gain from fall to spring is about one standard deviation (an appreciable increase).

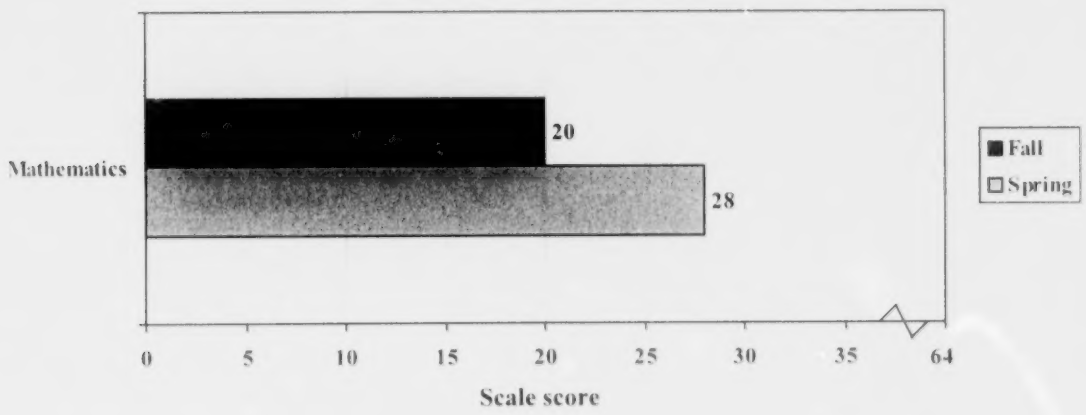
Figure A.—First-time kindergartners' mean reading scale scores: Fall 1998 and spring 1999



NOTE: The ECLS-K assessment was designed for both kindergarten and first-grade children. Therefore a mean score of approximately 30 in the spring of kindergarten is not unexpected.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

Children's mathematics scores increased by eight points from the fall to the spring (figure B). Thus, children's mathematics knowledge and skills increased about one standard deviation during the kindergarten year. For the most part, the gains children demonstrate in their overall reading and mathematics knowledge and skills do not differ markedly by child, family, and kindergarten program characteristics. For example, there is not more than a two-point difference in the gains children demonstrate in reading and mathematics by mother's education.

Figure B.—First-time kindergartners' mean mathematics scale scores: Fall 1998 and spring 1999



NOTE: The ECLS-K assessment was designed for both kindergarten and first-grade children. Therefore a mean score of approximately 30 in the spring of kindergarten is not unexpected.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

The absence of a substantial differential gain in children's general reading and mathematics knowledge and skills is seen again when we consider other characteristics of children, their families, and their kindergarten programs, such as children's age as they enter school and family risks for later school difficulty. The same is true when we look at school type and kindergarten program type. However when we consider the specific knowledge and skills children are acquiring (e.g., letter recognition, addition and subtraction, making friends, paying attention), children are developing particular cognitive and noncognitive knowledge and skills at different rates.

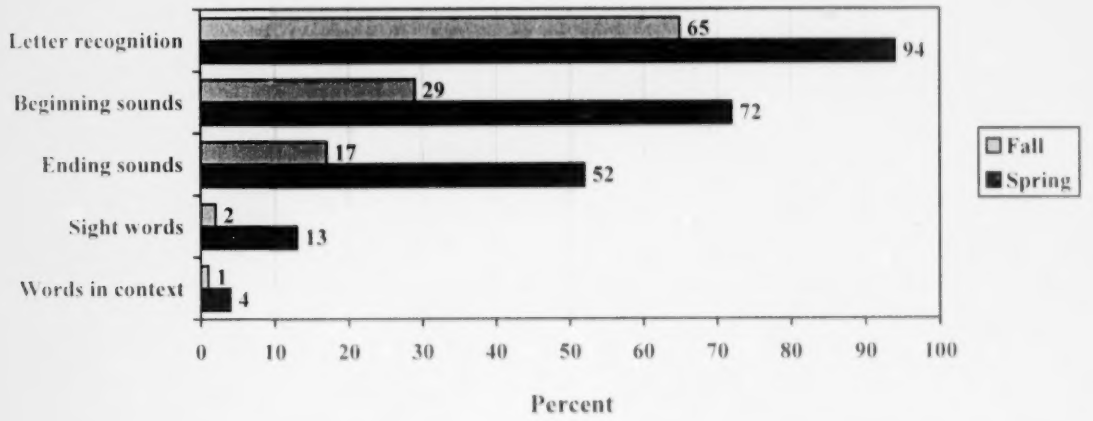
Question 2: Gain, Differences in Gain and Spring Kindergarten Status in Children's Specific Knowledge and Skills

To address the second set of questions, children's specific cognitive and noncognitive knowledge and skills were examined. Furthermore, the question of whether certain groups of children were more likely to acquire specific cognitive and noncognitive knowledge and skills than others was explored (e.g., does the probability that children acquire the reading skill of sight-word recognition vary by the level of their mother's education?). Finally, information is presented on the specific knowledge and skills children demonstrate in the spring of their kindergarten year as they are preparing for first grade.

In addition to the overall reading and mathematics scale scores, the ECLS-K assessment battery provides information on specific proficiencies. In the reading domain, the ECLS-K assessment battery provides information on: letter recognition; understanding of the letter-sound relationship at the beginning of words; understanding of the letter-sound relationship at the ending of words; sight-word recognition; and understanding of words in context. In the mathematics domain, the ECLS-K assessment battery provides information on: recognizing single-digit numbers and basic shapes; counting beyond 10, recognizing the sequence in basic patterns, and comparing the relative size (dimensional relationship) of objects; recognizing two-digit numbers, identifying the next number in a sequence, and identifying the ordinal position of an object; performing simple addition and subtraction; and performing basic multiplication and division.

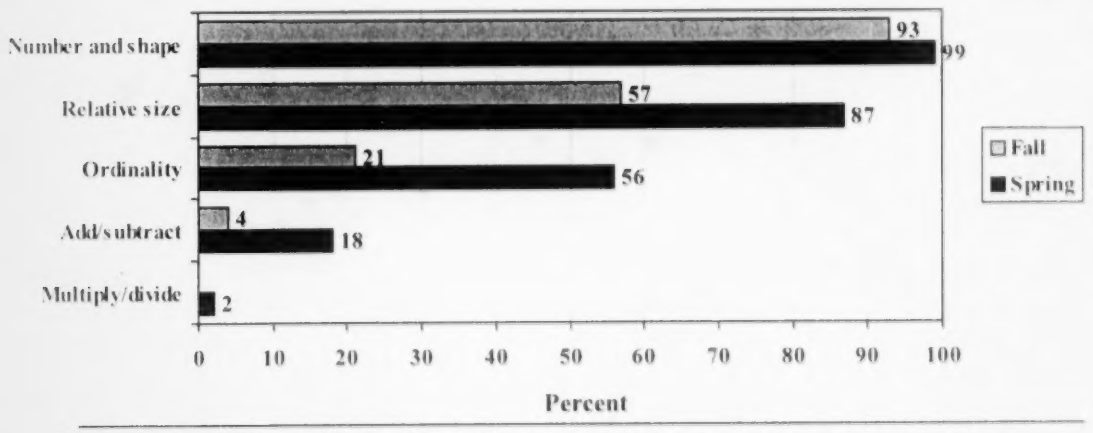
Across the kindergarten year, children acquire specific knowledge and skills in reading and mathematics (figures C and D). By the end of their kindergarten year, nearly all children recognize their letters, their numbers and their shapes. The percent of children who can recognize words by sight and demonstrate an understanding of words in context, though still relatively low, increased from kindergarten entry to kindergarten exit. And the numbers of children adding and subtracting also increased from kindergarten entry to kindergarten exit. We see less dramatic changes in children's social skills and approaches to learning across the kindergarten year, with a large percentage of children exhibiting prosocial behaviors and positive approaches to learning.

Figure C.—Percentage of first-time kindergartners demonstrating specific reading knowledge and skills: Fall 1998 and spring 1999



SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

Figure D.—Percentage of first-time kindergartners demonstrating specific mathematics knowledge and skills: Fall 1998 and spring 1999



SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

When we examined children's overall gains in reading and mathematics knowledge and skills, as measured by their reading and mathematics scale scores, by child, family and kindergarten program characteristics, we found little evidence of differential gains from fall to spring. Based on those findings, the conclusion might be that from fall to spring of kindergarten, all children are acquiring knowledge and skills at approximately the same rate, and that they are learning the same things. However, this is not completely accurate. We see a very different picture when we look at children's acquisition of specific knowledge and skills.

To illustrate, children from the more disadvantaged backgrounds (those with at least one risk factor) are closing the gaps in basic skills (i.e., recognizing their letters and counting beyond 10, recognizing the sequence in basic patterns and comparing the relative size of objects). However, these same children lag further behind their more advantaged classmates when it comes to gaining more sophisticated reading and mathematics knowledge and skills (i.e., recognizing words by sight or solving simple addition and subtraction problems). In fact, the gap has widened. The same basic patterns we see when we consider cumulative family-risk factors are present when we consider other child characteristics, such as race/ethnicity.

Furthermore, to illustrate, we see some evidence of differential gain in the frequency with which children demonstrate specific social skills. According to their teachers, younger children are more likely to acquire the skill of paying attention than their older counterparts during the kindergarten year.

As children are completing kindergarten and preparing for first grade, almost all (94 percent) children know their letters, and 72 percent understand the letter-sound relationship at the beginning of words, while 52 percent understand the letter-sound relationship at the ending of words. In fact, 13 percent demonstrate a proficient understanding of words by sight and 4 percent, words in context (figure C). In mathematics, 99 percent of children recognize their numbers and basic shapes, and the majority (87 percent) demonstrate understanding of dimensional relationships among objects (relative size). Just over half (56 percent) of children demonstrate an understanding of the mathematical concept ordinality. Moreover, 18

percent show they can add and subtract, and 2 percent are successfully performing multiplication and division (figure D).

Summary

Young children need knowledge and new experiences to develop and thrive. Schools offer a plethora of learning and development opportunities for children. Consequently, it is not surprising that across the kindergarten year children are rapidly acquiring the knowledge and skills integral to succeed in school and life.

This report presents a simple picture of the gains children make across the kindergarten year. The ECLS-K will follow these children through the fifth grade. We will be able to track children's performance and the differences in their performance, not only by child and family characteristics but also by teacher and school characteristics. This report represents only the beginning of understanding the role of the kindergarten year in children's development. Future analyses, based on the information from the ECLS-K, will help us understand the role of such things as child care, home educational environment, teachers' instructional practices, class size and the general climate, and facilities and safety of the schools.

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The Kindergarten Year

The kindergarten year marks a period of rapid change in the ways children think about themselves and the world around them (Bredekamp and Copple 1997; Sameroff and McDonough 1994). This change is influenced by both developmental factors (e.g., age, maturation) and environmental factors (e.g., schooling, home educational activities, family resources). Across this first year of schooling, children will acquire the knowledge and skills that will prove integral to their future success in school and in life.

Children enter school demonstrating a vast array of knowledge and skills, with some children further along than others (West et al. 2000). The kindergarten year serves multiple purposes and is geared toward the development of both cognitive and noncognitive knowledge and skills (Seefeldt 1990). And, depending on the child, knowledge and skills develop in different areas and at different rates across this year of school.

Classically, kindergarten has represented a place where children are given the opportunity to explore their world through play. Over the last 100 years, this idea has been refined to stress the importance of opportunity for active engagement and exploration in real-world settings (Dewey 1976, 1944; Roopnarine and Johnson 1993; Seefeldt and Barbour 1994). In the United States, kindergarten took root as an agent for change to help enrich the lives of children from disadvantaged backgrounds, with education seen as an important tool for social reform (Roopnarine and Johnson 1993; Seefeldt and Barbour 1994). Early childhood education continues today to be seen as an important influence on young children's development and learning, and most children regardless of their backgrounds attend kindergarten programs.

The original purpose of kindergarten—to "support children's social and emotional adjustment to group learning"—has been expanded to include support for children's cognitive development and preparation for the academic instruction to come (Bredekamp and Copple 1997, p. 142). While the cognitive benefits seem apparent, the effect of kindergarten on socioemotional development is less clear. Though historically the role of kindergarten was focused on socialization, a majority of children today have experience in early care and group settings prior to entering kindergarten (Bredekamp and Copple 1997; West et al. 2000;

West et al. 1992). Consequently, the role of kindergarten may be evolving toward a more cognitive purpose.

Over the years, research on our nation's children suggests that, by late elementary school, children are demonstrating differences in their knowledge and skills by characteristics such as socioeconomic status, level of maternal education, and race/ethnicity (Donahue et al. 1999; Reese et al. 1997). We are now beginning to document that some of these differences exist as children are just entering kindergarten (West et al. 2000).

To enrich the picture of children's first experience in formal education—the kindergarten year—we need to understand the knowledge and skills children possess as they enter kindergarten and we need to gain insight into how children's knowledge and skills develop across the kindergarten year. This report attempts to answer two basic sets of questions about children's knowledge and skill acquisition during the kindergarten year.

1. What gains are children making from the fall of their kindergarten year to the spring of their kindergarten year in their reading and mathematics knowledge and skills? Do these gains differ by child, family, and kindergarten program characteristics? As children are exiting kindergarten and preparing for first grade, how do their knowledge and skills differ by child, family, and kindergarten program characteristics (e.g., age, family-risk factors)?

2. What gains are children making in specific knowledge and skills (e.g., recognizing letters, recognizing numbers, paying attention)? Do children's gains in specific knowledge and skills differ by child, family, and kindergarten program characteristics? At the end of their kindergarten year when children are preparing for first grade, do their specific knowledge and skills differ by child, family, and kindergarten program characteristics (e.g., age, mother's education)?

To address the first set of questions, the change from the fall of kindergarten to the spring of kindergarten in children's reading and mathematics scale scores will be examined.[2] These

[2] The calculation of the reading and mathematics scale scores is described in the *Methodology and Technical Notes*.

scores reflect children's overall performance in these domains. The possibility that specific groups of children might demonstrate different rates of gain (e.g., children at risk for later school difficulty might not be acquiring reading knowledge and skills at the same rate as children not at risk for later school difficulty) will also be explored.

To address the second set of questions, specific cognitive and noncognitive knowledge and skills will be examined, and whether certain groups of children acquire specific cognitive and noncognitive knowledge and skills at different rates will be explored (e.g., do children's rates of acquiring the reading skill of sight-word recognition vary by the level of their mother's education?).

When group differences are discussed, children's knowledge and skills are examined by a common set of child, family, and kindergarten program characteristics. Children's knowledge and skills are examined in terms of children's sex, their age when they enter school, and their race/ethnicity. Characteristics of the family consist of the educational level of children's mothers and a composite index of family risks, which is comprised of children having a non-English primary language in the home, children living in a single-parent family, children's mothers having less than a high school education, and children's families having received welfare assistance (i.e., Aid to Families with Dependent Children). Consequently, the risk index ranges from 0 risks to 4. In this report, we collapsed the index into 3 categories, 0 risks, 1 risk, and 2 or more risks. The index provides information on the potential related effects when these risks exist in concert. Finally, children's knowledge and skills are explored by whether the children are enrolled in full- versus part-day kindergarten programs and in public versus private kindergarten programs. The characteristics examined in this report are likely to be highly interrelated. For example, the number of first-time kindergartners with different numbers of family risk factors varies by race/ethnicity. About 72 percent of Hispanic and black children come from families with one or more risk factors, as compared with 61 percent of Asian children, and 29 percent of white children (Zill and West 2000). While acknowledging this, this report looks at each characteristic separately when describing the children's knowledge and skills.

Organization of Report

The remainder of this report is organized into four sections. The findings are presented in two sections followed by a summary, and a methodology and technical notes section. The first findings' section pertains to the overall gains children make during the kindergarten year in reading and mathematics. Findings in this section are based on children's overall reading and mathematics scale scores. The second section of findings describes the extent to which children acquire specific reading and mathematics knowledge and skills during the kindergarten year. This section also includes information about children's acquisition of various social skills over the school year. In this section, findings are reported in terms of the probabilities that children demonstrate specific reading and mathematics proficiencies, and the percent of children who demonstrate specific social skills. Each of the two sections on findings presents information in three basic areas. First, each section begins with a description of the gains children make from fall of kindergarten to spring of kindergarten. Second, differences in the gains children make are examined for different groups of children defined by a set of child, family, and kindergarten program characteristics. Third, differences in children's status at the spring of kindergarten or as they are about to enter first grade are examined for these same groups of children. Comparisons made in the text were tested for statistical significance to ensure that the differences are larger than might be expected, due to sampling variation. All differences described are significant at the .05 level.

National Data on Kindergartners in the United States

The findings in this report come from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K).[3] The ECLS-K, sponsored by the U.S. Department of Education, National Center for Education Statistics (NCES), selected a nationally representative sample of kindergartners in the fall of 1998 and is following these children through the end of fifth grade. The full ECLS-K sample is comprised of approximately 22,000 children who attended about 1,000 kindergarten programs during the 1998–99 school year. The children attended

[3] Detailed information on the base-year design of the ECLS-K is presented in the *ECLS-K User's Manual* (NCES 2001–029). The data set related to this report may be obtained through NCES upon request (e-mail: ECLS@ed.gov).

both public (85 percent) and private (15 percent) kindergartens that offered full day (55 percent) and part day (45 percent) kindergarten programs. All kindergarten children within the sampled schools were eligible for the sampling process, including language minority and special education students. The sample includes children from different racial/ethnic and socioeconomic backgrounds. In the fall of 1998, about 95 percent of kindergartners were entering school for the first time. This report focuses on these first-time kindergartners.[4] When information on children's cognitive knowledge and skills is presented, this report focuses on the children in the sample who received the cognitive assessment in English in both the fall and the spring of their kindergarten year.[5]

This report includes information that was captured through direct one-on-one child assessments, parent interviews, and teacher questionnaires administered in the fall and the spring of the children's kindergarten year. The *Methodology and Technical Notes* section provides more detail on the instrumentation and operations.

Question 1: Gain, Differences in Gain, and Spring Kindergarten Status in Children's Knowledge and Skills

During the early elementary school years, children are rapidly acquiring both cognitive and social knowledge and skills (Bredekamp and Copple 1997; Sameroff and McDonough 1994). In this section, gain in children's reading and mathematics knowledge and skills will be addressed. The ECLS-K directly assessed children's cognitive skills with a reading and mathematics battery.[6] The reading assessment captured information on children's basic literacy skills, such as understanding the directionality of print, recognizing letters, identifying sounds, word reading, vocabulary, and reading comprehension. The mathematics

[4] See table 1 for the sample demographics.

[5] Approximately 30 percent of Hispanic children and 19 percent of Asian children were not assessed in English and are not included in the estimates related to cognitive knowledge and skills. The Hispanic children who were proficient in Spanish were assessed in Spanish (for details see *Methodology and Technical Notes, Constructs, and Variables Used in Analysis*). The Hispanic and Asian children not assessed in English are included in the estimates related to noncognitive knowledge and skills. Due to specific instructions listed in the child's school record about one-half percent of children were excluded from the cognitive assessment based on a disability.

[6] In addition to reading and mathematics, the ECLS-K also assessed children's general knowledge. These data are not included in this report.

assessment measured children's conceptual understanding of numbers, shapes, patterns, mathematical operations, and processes for problem solving.

To address children's social knowledge and skills, teachers were asked to assess individual behaviors exhibited by the children. For this report, these teacher-rated items were not scaled. Instead, children's individual behaviors will be reported on in the next section, where developmental gain in relation to specific knowledge and skills is addressed.

To understand how children's reading and mathematics knowledge and skills are changing across the kindergarten year, their overall gains in their knowledge and skills will be described. Next, differences in these gains by child, family, and kindergarten program characteristics will be explored. And finally, information about their status and the differences in their status in the spring of their kindergarten year, as they are preparing for first grade, will be presented.

Gain in Knowledge and Skills from Fall to Spring

As their kindergarten year comes to a close, children demonstrate higher levels of reading and mathematics knowledge and skills than they demonstrated as they entered school for the first time (figures 1 & 2, table 2).[7] Children's reading scale scores increased by 10 points from the fall to the spring. Consequently, the gain from fall to spring is about one standard deviation (an appreciable increase). Children's mathematics scores increased by eight points from the fall to the spring. Thus, children's mathematics knowledge and skills increased about one standard deviation during the kindergarten year.[8]

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[7] The reading scale ranged from 0–72, with fall scores ranging from 10–70 and spring 10–71. The math scale ranged from 0–64, with fall scores ranging from 6–60 and spring scores 7–60.

[8] A standard deviation provides information on the spread of the distribution of scores. In a normal distribution, approximately 68 percent of scores fall within plus or minus one standard deviation of the mean, and approximately 95 percent fall within plus or minus two standard deviations of the mean. The means and standard deviations for children's overall reading and mathematics performance in this report are as follows–Mean (standard deviation): fall reading–22 (8), fall mathematics–20 (7), spring reading–32 (10), spring mathematics–28 (9), change in reading–10 (6), and change in mathematics–8 (5).

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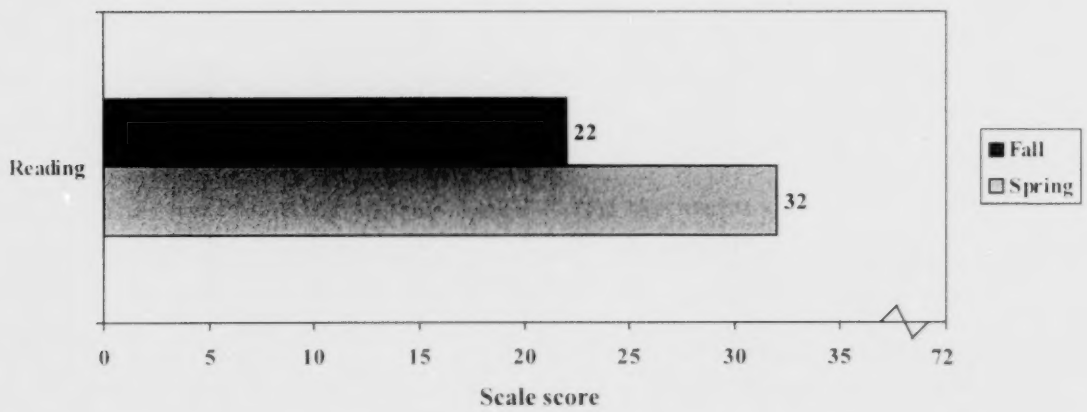
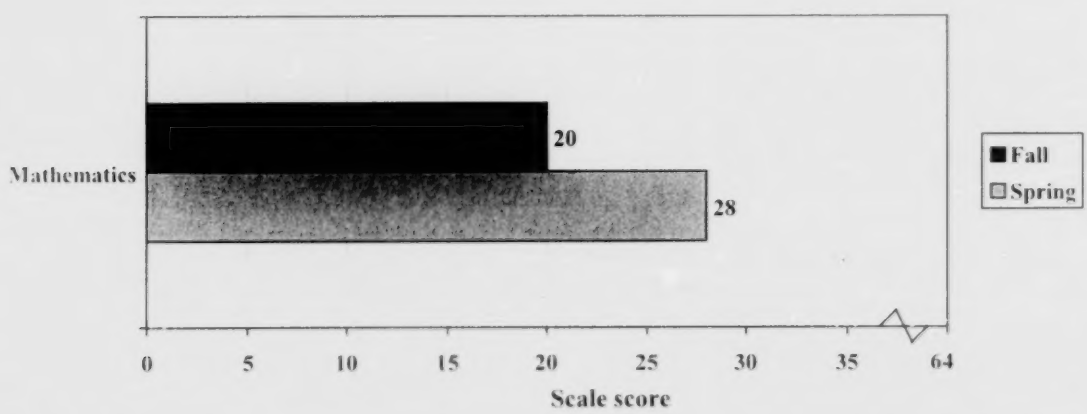
Figure 1.—First-time kindergartners' mean reading scale scores: Fall 1998 and spring 1999



NOTE: The ECLS-K assessment was designed for both kindergarten and first-grade children. Therefore a mean score of approximately 30 in the spring of kindergarten is not unexpected.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

Figure 2.—First-time kindergartners' mean mathematics scale scores: Fall 1998 and spring 1999



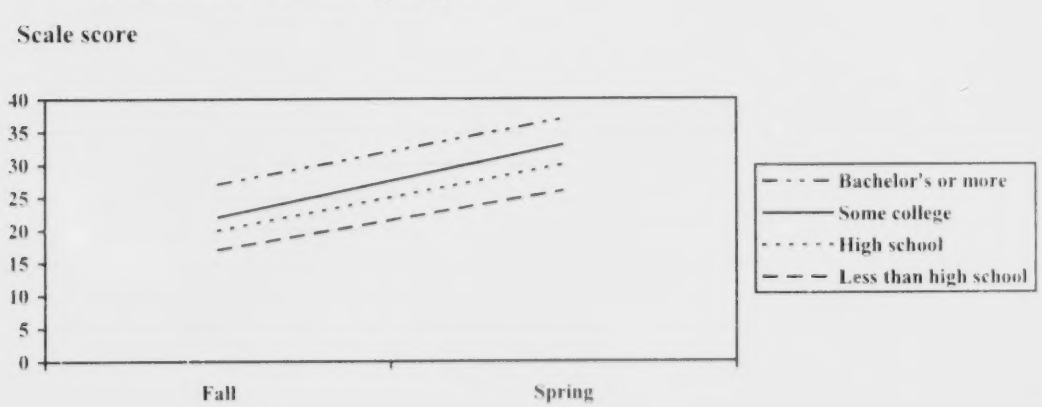
NOTE: The ECLS-K assessment was designed for both kindergarten and first-grade children. Therefore a mean score of approximately 30 in the spring of kindergarten is not unexpected.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

Differences in Gain of Children's Knowledge and Skills by Child, Family and Kindergarten Program Characteristics

Children gain reading and mathematics knowledge and skills during the kindergarten year; and, for the most part, these gains do not differ markedly by child, family, and kindergarten program characteristics (table 2). For example, there is not more than a two-point difference in the gains children demonstrate in reading and mathematics by mother's education (figure 3).

This absence of a substantial differential gain in children's general reading and mathematics knowledge and skills is seen again when we consider other characteristics of children, their families, and their kindergarten programs, such as children's age as they enter school and family risks for later school difficulty. The same is true when we look at school type and kindergarten program type. Thus, the differences we see in the fall have not diminished over the school year. However, as we will see in the next section, when we consider the specific knowledge and skills children are acquiring (e.g., letter recognition, addition and subtraction, making friends, paying attention), children are developing particular cognitive and noncognitive knowledge and skills at different rates.

Figure 3.—First-time kindergartners' reading mean scale scores, by mother's education: Fall 1998 and Spring 1999



SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

Differences in Children's Knowledge and Skills by Child, Family and Kindergarten Program Characteristics: Spring of Kindergarten

As children are just beginning school, their knowledge and skills already differ (West et al. 2000; Zill and West 2000). This begs the question—at the end of their kindergarten year as they are preparing to enter first grade, do children's knowledge and skills still differ by child, family, and kindergarten program characteristics? In other words, as children enter school for the first time, their reading and mathematics knowledge and skills differ by their age at entry, the level of their mother's education, their race/ethnicity, and risk factors associated with school success, such as primary language in the home or living in a single-parent household. Do we find these same differences after a year of formal schooling?

Age: Since kindergarten attendance is not mandatory in all states, parents have some flexibility in deciding when to enroll their children. Most states have age of entry guidelines that require children to have turned age 5 sometime between August 31 and January 1. Therefore, the majority of children entering kindergarten in the fall of 1998 were born between September 1992 and December 1993 (West et al. 2000). When considering the variation in children's knowledge and skills by their age, we focus our comparisons on children born between September 1992 through December 1993 (i.e., the "mainstream" ages). We present some limited information on children who are slightly older than the mainstream—those born January through August of 1992. These children represent a unique and diverse group (e.g., those whose parents may have delayed them to provide them with an advantage or due to developmental concerns, or whose schools may have a kindergarten readiness requirement), so we do not focus on them in our analysis.

In the spring of their kindergarten year, older children possess higher reading and mathematics knowledge and skills than their younger counterparts[9] (table 2). Thus, the slight advantage older children possessed as they entered kindergarten persists across the school year.

[9] Reaney, West, and Denton (2000) found that children's age at school entry accounts for a minimal amount of variance in their beginning knowledge and skills (2–3 percent), once factors such as SES and mother's education are taken into consideration.

Maternal Education: Similar to when they entered kindergarten, at the end of their kindergarten year, children's reading and mathematics knowledge and skills differ by the level of their mother's education. Kindergartners whose mothers have higher levels of education demonstrate higher levels of reading and mathematics knowledge and skills than kindergartners whose mothers have less education (table 2).

Race/Ethnicity: Children who are white and Asian demonstrate higher levels of reading and mathematics knowledge and skills than their black and Hispanic classmates (table 2). Again, this is a pattern we observed at the start of the kindergarten year.

Risk: When considering family risks for later school difficulty (e.g., low maternal education, non-English primary language in the home), it is important to understand how these factors behave cumulatively. Consequently, we consider the impact of multiple risks on children's knowledge and skills. To do this, we constructed an index which consists of the following risk factors: mother's education less than high school, family utilization of AFDC and/or food stamps, single-parent family, and primary home language other than English. The index is scored zero, one or two or more—meaning the presence of none of the risk factors, the presence of one of the risk factors, or the presence of two or more of the risk factors.

The fewer the risk factors present, the better kindergartners seem to be doing in reading and mathematics. At the end of the kindergarten year, just as they did at the beginning, children who have fewer risk factors demonstrate higher levels of reading and mathematics knowledge and skills than those with two or more risk factors (table 2).

School Type and Kindergarten Program Type: The type of school children attend and the type of kindergarten program in which children are enrolled have been associated with their academic school performance. Consequently, we explore children's knowledge and skills by the type of school (i.e., public or private) and the type of kindergarten program they attend (i.e., full day or part day). In the spring, children who attend private kindergartens demonstrate higher levels of reading and mathematics knowledge and skills. The differences by school type should be interpreted with caution, for children demonstrate different levels of knowledge and skills by their school type at the beginning of their kindergarten year (i.e.,

when schools have not had the opportunity to have an effect on children's performance) (table 2). In terms of kindergarten program type (i.e., all day or part day), there is little meaningful difference in the level of children's end-of-year reading and mathematics knowledge and skills.

Question 2: Gain, Differences in Gain, and Spring Kindergarten Status in Children's Specific Knowledge and Skills

Previously, we described the overall gains children experience across the kindergarten year. Seemingly, all children are gaining knowledge and skills at similar rates; however, a different picture emerges when we explore the specific areas in which children are gaining knowledge and skills. When we do this, we find specific groups of children are gaining certain knowledge and skills at different rates. To illustrate this, we look at how children's specific knowledge and skills change from the fall of kindergarten to the spring of kindergarten. Further, we explore whether the gains in children's specific knowledge and skills vary by child, family, and kindergarten program characteristics (e.g., those at risk for later school difficulty). Finally, we examine whether the differences in children's specific knowledge and skills by child, family, and kindergarten program characteristics (e.g., children's age, their mother's education, their race/ethnicity) persist across the kindergarten year (for more information on such differences at school entry, see West et al. 2000).

Gain in Specific Knowledge and Skills from Fall to Spring

Cognitive Knowledge and Skills

In addition to the reading and mathematics scale scores, the ECLS-K assessment battery provides information on specific proficiencies. Additional information on the cognitive assessment battery is provided in the *Methodology and Technical Notes* section.

In the reading domain, the ECLS-K assessment battery provides information on:

- letter recognition;
- understanding of the letter-sound relationship at the beginning of words;
- understanding of the letter-sound relationship at the ending of words;

- sight-word recognition; and
- understanding of words in context.

In the mathematics domain, the ECLS-K assessment battery provides information on:

- recognizing single-digit numbers and basic shapes;
- counting beyond 10, recognizing the sequence in basic patterns, and comparing the relative size (dimensional relationship) of objects;
- recognizing two-digit numbers, identifying the next number in a sequence, and identifying the ordinal position of an object;
- performing simple addition and subtraction; and
- performing basic multiplication and division.

For simplicity, we will refer to these sets of mathematical skills by the most sophisticated skill in the set (i.e., number and shape, relative size, ordinality, add/subtract, multiply/divide). The addition, subtraction, multiplication and division items are presented in the form of word problems with picture support and in numerical statements.

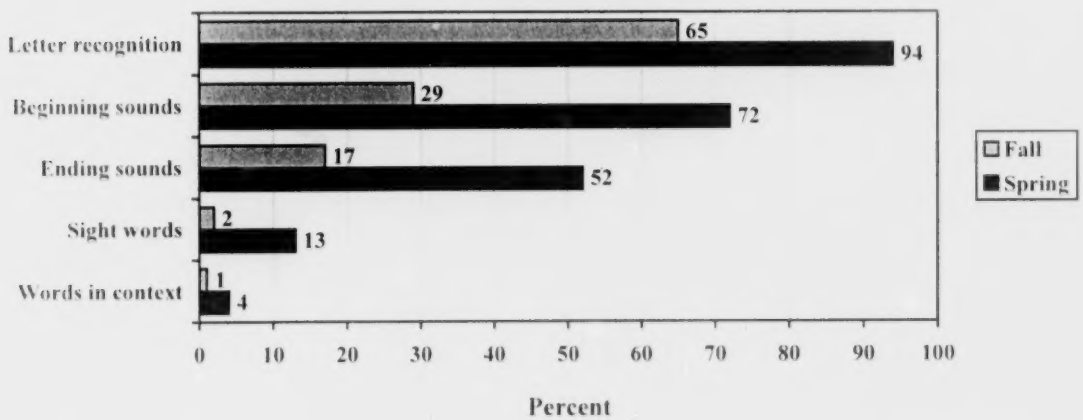
In terms of specific knowledge and skills in reading, at kindergarten entry, two-thirds of children (65 percent) can recognize their letters and some understand the letter-sound relationship at the beginning and ending of words (29 percent and 17 percent, respectively).[10] When we look at these skills at the end of kindergarten, the picture is very different. As they are finishing kindergarten, nearly all first-time kindergartners are recognizing their letters (94 percent), and nearly three out of four children (72 percent) understand the letter-sound relationship at the beginning and about half (52 percent) understand the letter-sound relationship at the ending of words (figure 4, table 3).

We also see that children are gaining in terms of recognizing words and understanding words in context. At kindergarten entry, very few children recognize words by sight (2 percent) and understand words in context (1 percent). These numbers increase by the end of kindergarten.

[10] The estimates in this report do not exactly match those found in *America's Kindergartners* (a previous report based on the same data). This report utilizes both fall and spring child assessment scores, therefore a different weight was used in making the estimates. The weight in this report is based on children with both fall and spring assessment scores, whereas the weight used in *America's Kindergartners* was tailored to children with only fall assessment scores. The weight in this report is stricter in its response requirements and utilizes a slightly smaller sample of children.

As children are completing the first year of school, 13 percent recognize words by sight and 4 percent understand words in context (figure 4, table 3).

Figure 4.—Percentage of first-time kindergartners demonstrating specific reading knowledge and skills: Fall 1998 and spring 1999



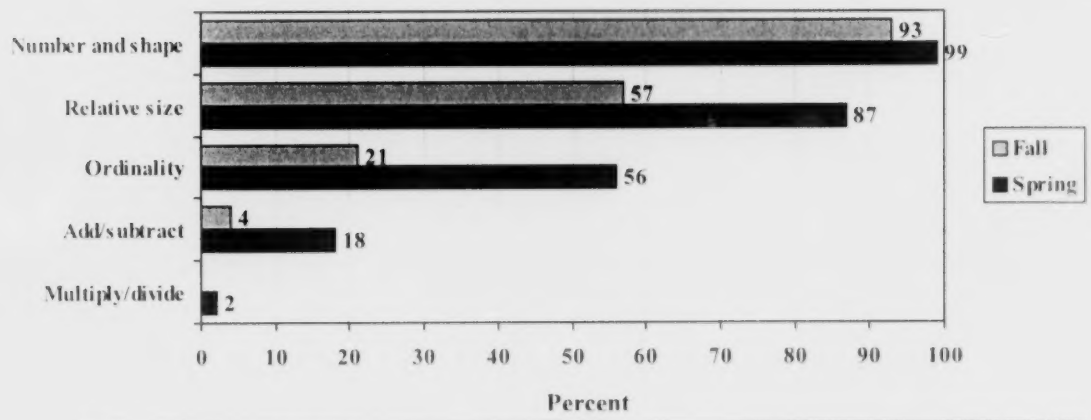
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

Regarding children's mathematical knowledge and skills, when children enter kindergarten for the first time, most are familiar with basic numbers and shapes (93 percent). By the end of kindergarten, nearly all children can demonstrate these skills (99 percent). In terms of the skills represented by relative size, 57 percent of children demonstrate these skills at the beginning of kindergarten, increasing to 87 percent of children at the end of kindergarten. The number of children able to demonstrate the skills represented by ordinality more than doubles from fall (21 percent) to spring (56 percent) (figure 5, table 4).

Though few children (4 percent) demonstrate the ability to solve simple addition and subtraction problems at the beginning of kindergarten, almost five times as many demonstrate these skills at the end of kindergarten (18 percent). A similar pattern is found for multiplication and division—few (less than 1 percent) demonstrate an understanding of

multiplication and division at the beginning of kindergarten and the number approximately doubles by the end of kindergarten (2 percent) (figure 5, table 4). We may not expect kindergarten children to have these higher mathematical knowledge and skills, but some kindergarten children demonstrate these higher level mathematical knowledge and skills.

Figure 5.—Percentage of first-time kindergartners demonstrating specific mathematics knowledge and skills: Fall 1998 and spring 1999



SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

Noncognitive Knowledge and Skills

Along with their cognitive knowledge and skills, children's social skills and approaches to learning are important for school success (Kagan et al. 1995; Meisels et al. 1996). The ECLS-K assesses children's social skills and approaches to learning by asking their teachers to rate the frequency with which children exhibited certain behaviors, such as making friends, arguing with others and persisting at tasks. Three behaviors exemplify children's prosocial interactions: accepting peer ideas, making friends, and comforting others. Three behaviors exemplify children's problem behaviors: arguing with others, fighting with others, and getting angry easily. Finally, three behaviors capture how children approach learning: persistence at tasks, eagerness to learn, and paying attention in class. Teachers were asked to

rate these behaviors as occurring *never*, *sometimes*, *often*, or *very often*. In this report, we collapse the categories into *never/sometimes* or *often/very often*.

Similar to children's cognitive knowledge and skills, we see change in children's social skills and in how they approach learning (tables 5, 6, and 7). According to their teachers,[11] in the spring of their kindergarten year, a majority of children often or very often accept peer ideas in cooperative activities (77 percent), form friendships easily (82 percent) and comfort others (62 percent). This is a slight increase from when these same children entered kindergarten, when 74 percent often or very often accepted peer ideas in cooperative activities, 77 percent formed friendships easily, and 52 percent comforted others (table 5). Similar to the fall, in the spring of kindergarten relatively few children show problem behaviors often or very often. For example, in the spring, teachers reported 13 percent of children often or very often argue with others, 8 percent fight with others, and 9 percent get angry easily (table 6). In terms of how children approach learning, across the kindergarten year, we see slight increases in how often they persist at tasks (fall, 71 percent—spring, 75 percent), demonstrate an eagerness to learn (fall, 75 percent—spring, 79 percent) and pay attention well (fall, 66 percent—spring, 70 percent) (table 7).

Summary: Gain in Specific Knowledge and Skills, Fall to Spring

Across the kindergarten year, children are gaining specific reading and mathematics knowledge and skills. By the end of their kindergarten year, nearly all children recognize their letters, their numbers and their shapes. The percent of children who can recognize words by sight and demonstrate an understanding of words in context, though still relatively low, increased across the kindergarten year. And the numbers of children adding and subtracting also increased across the kindergarten year.

We see less dramatic changes in children's social skills and approaches to learning across the kindergarten year, though we do see that for the most part, children are gaining in prosocial interaction and in their approaches to learning. It should be noted that the gains children make in the cognitive area cannot truly be compared to the gains children make in the social

[11] In most cases, the same teacher rated the child at both points in time. Therefore, gains in these areas should be interpreted with this in mind.

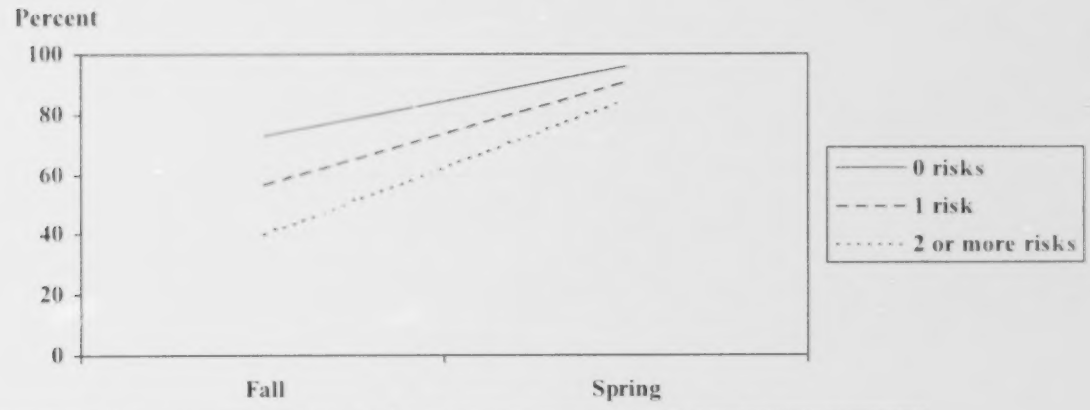
areas. For the cognitive assessment, we were able to administer a more comprehensive direct assessment. In the social area, for these very young children, we relied on the teacher's report. Therefore, the less dramatic changes we report in social skills and approaches to learning may be, in part, attributed to how well we are able to measure these different developmental domains.

Differences in the Gain of Children's Specific Knowledge and Skills by Child, Family, and Kindergarten Program Characteristics

When we examined children's overall gains in reading and mathematics knowledge and skills, as measured by their reading and mathematics scale scores, by child, family and kindergarten program characteristics, we found little evidence of differential gains from fall to spring. Based on those findings, the conclusion might be that from fall to spring of kindergarten all children are acquiring knowledge and skills at approximately the same rate and that they are learning the same things. However, this is not completely accurate. We see a very different picture when we look at children's acquisition of specific knowledge and skills.

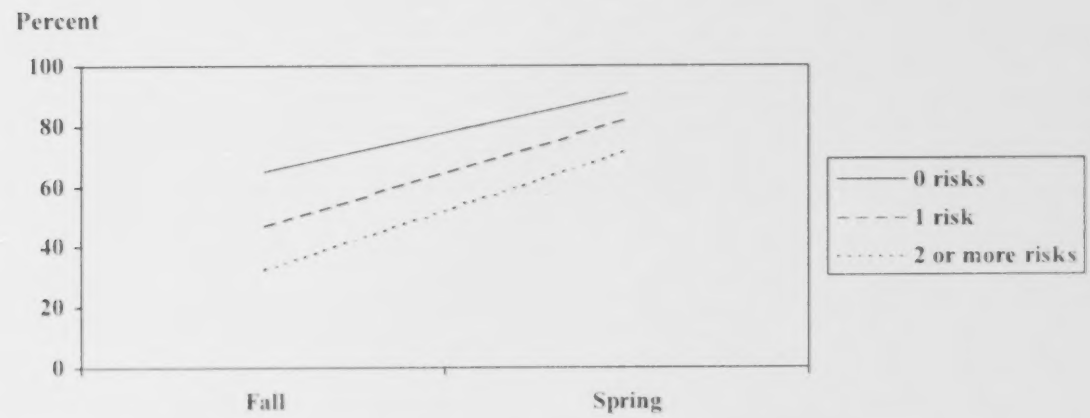
To illustrate, children from the more disadvantaged backgrounds (those with at least one risk factor) are closing the gaps in basic skills (i.e., recognizing their letters and counting beyond 10, recognizing the sequence in basic patterns, and comparing the relative size of objects) (figures 6 and 7). However, these same children lag further behind their more advantaged classmates when it comes to gaining more sophisticated reading and mathematics knowledge and skills (i.e., recognizing words by sight or solving simple addition and subtraction problems) (figures 8 and 9). In fact, the gap has widened.

Figure 6.—Percentage of first-time kindergartners recognizing their letters, by number of risk factors: Fall 1998 and spring 1999



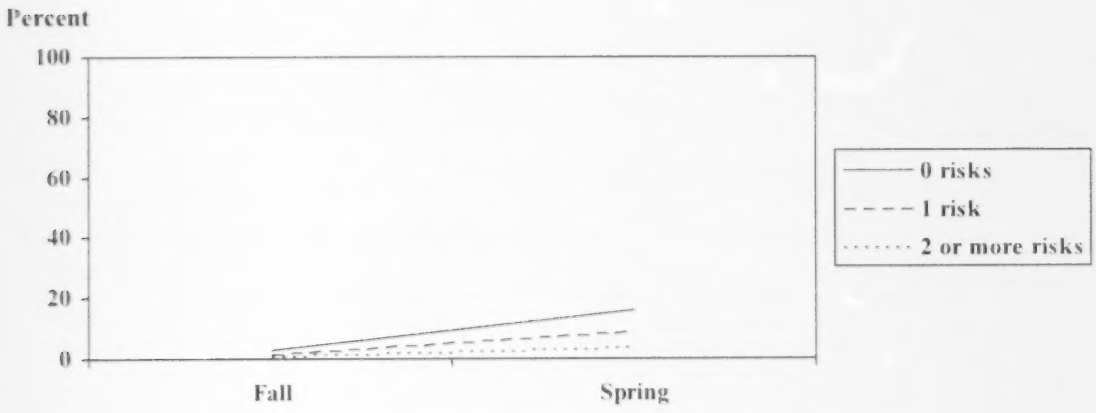
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

Figure 7.—Percentage of first-time kindergartners counting beyond 10, recognizing the sequence in basic patterns and comparing the relative size of objects, by number of risk factors: Fall 1998 and spring 1999



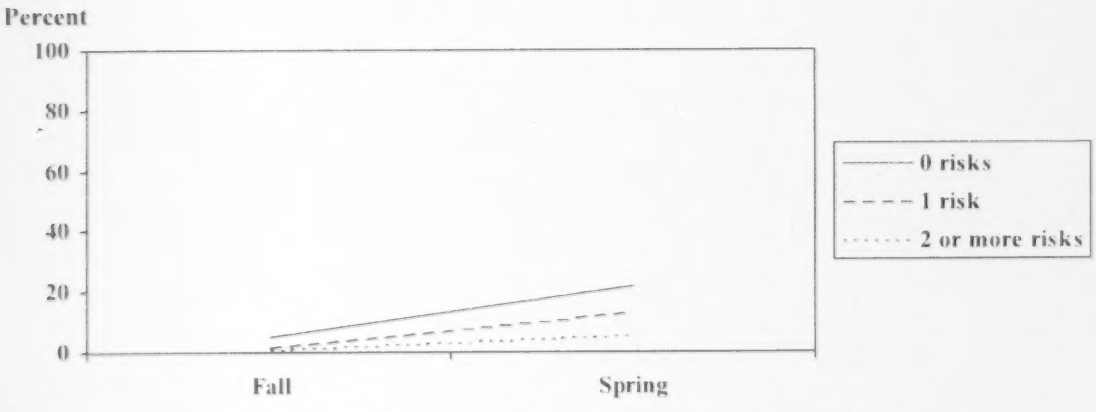
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

Figure 8.—Percentage of first-time kindergartners recognizing words by sight, by number of risk factors: Fall 1998 and spring 1999



SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

Figure 9.—Percentage of first-time kindergartners adding and subtracting, by number of risk factors: Fall 1998 and spring 1999



SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

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The same basic patterns we see when we consider cumulative family risk factors are present when we consider other child characteristics, such as race/ethnicity (tables 3 and 4). For example, during the kindergarten year, black and Hispanic children closed the gap with white and Asian children in basic reading and mathematics knowledge and skills (i.e., recognizing letters and relative size). Yet, they are not acquiring the more advanced knowledge and skills (i.e., sight words and addition) at the same rate as their white and Asian counterparts.

Furthermore, to illustrate, we see some evidence of differential gain in the frequency with which children demonstrate specific social skills (tables 5, 6, and 7). According to their teachers, younger children are more likely to acquire the skill of paying attention than their older counterparts during the kindergarten year (table 7).

Differences in Children's Specific Knowledge and Skills by Child, Family, and Kindergarten Program Characteristics: Spring of Kindergarten

Kindergartners acquire specific knowledge and skills across the school year. As children enter school, differences exist in their knowledge and skills by child and family characteristics (West et al. 2000). We see similar differences as children are finishing kindergarten and preparing for first grade (tables 3 and 4).

Age:[12] In the spring of their kindergarten year, older children possess higher specific reading and mathematics knowledge and skills than their younger counterparts. For example, older first-time kindergartners are more likely to demonstrate emergent literacy skills and knowledge (i.e., recognizing their letters and understanding the letter-sound relationship at the beginning and ending of words) than younger kindergartners (table 3). Older kindergartners are also more likely than younger kindergartners to be reading (i.e., recognizing words by sight and understanding words in context) (table 3).

We see a similar pattern in children's specific mathematics knowledge and skills. Almost all kindergartners know their basic numbers and shapes; however, older kindergartners are more

[12] Similar to the discussion on children's reading and mathematics knowledge and skills, when we make comparisons by age, we are comparing the children born in the mainstream age groups, those born between September 1992 and December 1993.

likely than younger kindergartners to demonstrate other early mathematics knowledge and skills (i.e., relative size; ordinality) (table 4). Older kindergartners are also more likely to do simple addition and subtraction problems and even to do simple multiplication and division problems (table 4).

Overall, the frequency with which children, in the spring of their kindergarten year, engage in prosocial behaviors, such as accepting peer ideas, making friends and comforting others, does not differ by their age. However, we see a difference between the older kindergartners (those just turning 6 as they enter school—born September through December 1992) and the youngest kindergartners (those just turning 5 as they enter school—born September through December 1993). How children approach learning differs by their age. Older kindergartners are more likely to persist at tasks, seem more eager to learn and to pay attention than their younger counterparts (table 7).

Maternal Education: Similar to when they entered kindergarten, at the end of their kindergarten year children's specific reading and mathematics knowledge and skills differ by the level of their mother's education. Children whose mothers have higher levels of education, do better in specific reading and mathematics areas than children whose mothers have less education. For instance, children whose mothers have higher levels of education are more likely to demonstrate emergent literacy knowledge and skills than children whose mothers have less education (table 3). Moreover, children whose mothers have higher levels of education are more likely than children whose mothers have less education to be reading (i.e., recognizing words by sight and understanding words in context) (table 3). The same basic pattern is evident in mathematics. Children whose mothers have higher levels of education are more likely to demonstrate mathematics knowledge and skills (i.e., relative size, ordinality, addition/subtraction, and multiplication/division) than children whose mothers have less education (table 4).

How often children exhibit prosocial interactions and problem behaviors at the end of their kindergarten year differs by the level of their mother's education. Children whose mothers have higher levels of education are more likely to often or very often accept peer ideas in play, make friends, and comfort others (table 5). In terms of their problem behaviors,

children whose mothers have less education are more likely to argue with others, fight with others, and get angry easily than children whose mothers have more education (table 6). How children approach learning also differs by their mother's education. Children with mothers who have more education are more likely to persist at tasks, seem eager to learn, and pay attention than children whose mothers have less education (table 7).

Race/ethnicity: Children's reading and mathematics knowledge and skills differ by their race/ethnicity. White and Asian children tend to have higher specific reading and mathematics knowledge and skills than their black and Hispanic classmates. White and Asian children are generally more likely to demonstrate reading and mathematics knowledge and skills than black and Hispanic children (tables 3 and 4).

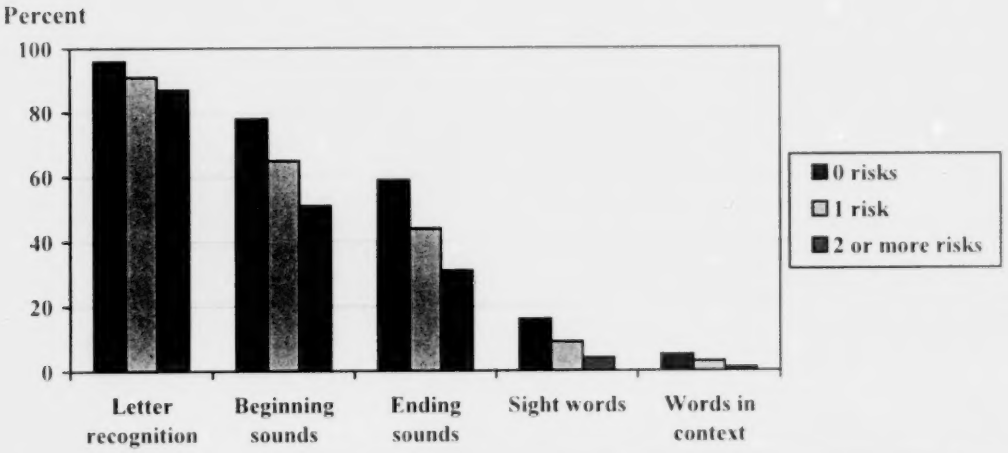
According to their teachers, in the spring of their kindergarten year, children's social skills and how they approach learning differs by their race/ethnicity.[13] White and Asian children are more likely to accept peer ideas and form friendships than black children (table 5). Black children are more likely to get angry easily, argue with others, and fight with others than white, Asian and Hispanic children (table 6). Also according to their teachers, Asian children are the most likely to persist at tasks, seem eager to learn, and pay attention; and white children are more likely to exhibit these behaviors than black or Hispanic children (table 7).

Risk: To explore children's specific knowledge and skills by family risk factors, we utilize the risk factor index (discussed earlier in this report). At the end of the kindergarten year, children who have fewer risk factors are doing better than children with more risk factors in each of the specific areas of reading and mathematics measured in the ECLS-K (tables 3 and 4). This is true in terms of kindergartners' specific reading (figure 10) and mathematics (figure 11) knowledge and skills. For example, children who have fewer risks are more likely than children with more risks to recognize their letters and understand the letter-sound relationship at the beginning and ending of words. A similar pattern is evident in terms of children's ability to understand the mathematical concepts of relative size and ordinality.

[13] Information on children's social skills and how they approach learning is provided by their teachers. Consequently, there may be an interaction between the teacher's race/ethnicity and the race/ethnicity of the child that is not accounted for in this analysis. For example, teachers whose race/ethnicity matches that of the children may rate children differently from teachers whose race/ethnicity is different from other children.

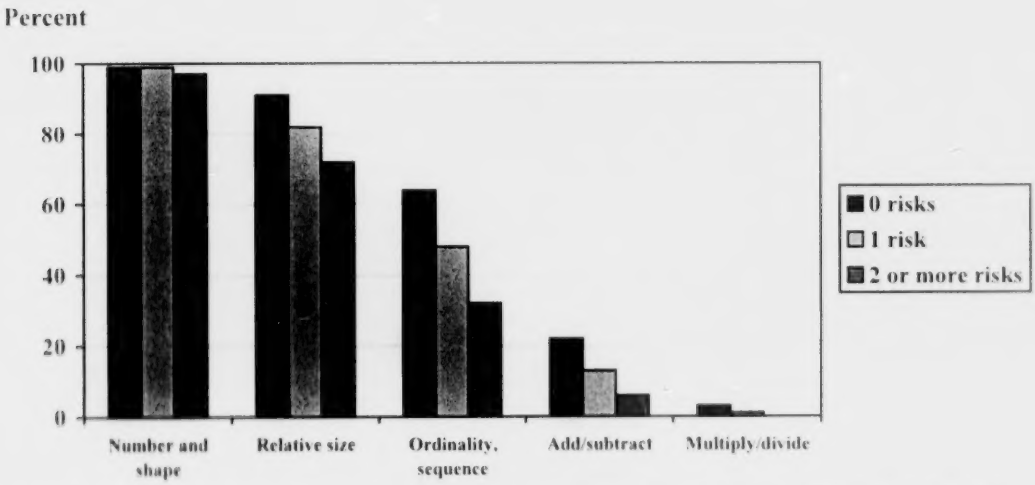
In the spring, teachers report that kindergartners with fewer risk factors are more likely to often or very often accept peer ideas and form friendships, and less likely to argue with others, fight with others, and get angry easily than children with more risk factors (tables 5 and 6). How children approach learning is also associated with the number of family risk factors. According to their teachers, children with fewer risk factors are more likely to persist at tasks, to seem eager to learn, and to pay attention well than children with more risk factors (table 7).

Figure 10.—Percentage of first-time kindergartners demonstrating specific reading knowledge and skills, by number of family risk factors: Spring 1999



SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

Figure 11.—Percentage of first-time kindergartners demonstrating specific mathematics knowledge and skills, by number of family risk factors: Spring 1999



SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

School Type and Kindergarten Program Type: In the spring of their kindergarten year, children who attend private kindergartens are more likely to demonstrate, in specific areas, the various reading and mathematics knowledge and skills than children in public school kindergartens.[14] However, any differences in the spring of kindergarten in children's specific cognitive knowledge and skills by school type need to be interpreted with caution. These differences also exist in the fall, as children are entering kindergarten for the first time (tables 3 and 4). In the spring of their kindergarten year, there are no differences by kindergarten program type in children's basic reading knowledge and skills (i.e., letter recognition, beginning sounds) and no difference in any of their specific mathematics knowledge and skills. Children in full-day programs are more likely to understand the letter-sound relationship at the end of words, recognize words by sight, and understand words in

[14] Differences in school type may reflect, in part, differences in socioeconomic status of the families whose children attend public and private schools (Zill & West forthcoming).

context than children in part-day kindergartens (table 3).

Though no clear pattern emerges in children's prosocial behaviors (e.g., accepting peer ideas and forming friendships) by their school type or their program type, there are some interesting differences when we examine children's problem behaviors by kindergarten program type (i.e., how often they argue with others and fight with others) (tables 5 and 6). According to their teachers, children in full-day kindergarten programs are more likely than children in part-day programs to exhibit these problem behaviors. Once again, caution should be used in interpreting differences, as the same differences are observed at kindergarten entry. In terms of kindergarten program type, it is interesting to note that children in full-day programs may demonstrate slightly higher cognitive knowledge and skills, but they also are more likely to exhibit a higher frequency of some problem behaviors.

Summary

Young children need knowledge and new experiences to develop and thrive. Schools offer a plethora of learning and development opportunities for children. Consequently, it is not surprising that across the kindergarten year, children are rapidly acquiring the knowledge and skills integral to succeed in school and life.

Across the kindergarten year, children's reading and mathematics scores increase by about a standard deviation. Often, it is difficult to interpret what this type of gain means. Therefore, in this report we provide information on the specific reading and mathematics knowledge and skills children are gaining. For example, we know that as children enter kindergarten for the first time about two-thirds know their letters, while by the end of kindergarten almost all (94 percent) children know their letters. We know that the number of children who understand the letter-sound relationship at the beginning of words more than doubles across the kindergarten year; and the number of children who understand the letter-sound relationship at the ending of words triples. In mathematics, by the end of kindergarten, nearly all children (99 percent) recognize their numbers and basic shapes, and the majority demonstrate understanding of dimensional relationships among objects (relative size). Furthermore, the number of children who demonstrate understanding of the mathematical concept ordinality more than doubles across the kindergarten year; the number of children who demonstrate that they can do basic addition and subtraction increases. We see less dramatic changes in children's social skills and approaches to learning. A large percentage of children exhibit prosocial behaviors and positive approaches to learning as they are ending kindergarten and preparing for first grade.

When we look at which children are demonstrating gains in reading and mathematics knowledge and skills, we find an interesting picture. As children enter kindergarten, they demonstrate a wide range of knowledge and skills. At kindergarten entry, children at risk for later school difficulty (as indicated by the risk-factor index we formed) are less likely to know their letters, understand the letter-sound relationship at the beginning and ending of words, know their numbers, demonstrate an understanding of relative size and of ordinality (West et al. 2000). Across the kindergarten year, we see that these same children (those at

risk) are gaining, in terms of basic reading and mathematical knowledge and skills (i.e., letters, relative size), on their more advantaged counterparts—in other words, the gap is closing. However, at-risk children are falling further behind in terms of the more sophisticated reading and mathematics knowledge and skills (i.e., recognizing words by sight, addition/subtraction)—in other words, the gap is widening. As a result, by the end of kindergarten, we see many of the same differences in knowledge and skills that we saw at the beginning of the school year. After a year of formal schooling, we still see differences in children's knowledge and skills by child and family characteristics (e.g., children with mothers who have higher levels of education demonstrate higher reading and mathematics knowledge and skills, children with fewer risks for later school difficulty demonstrate higher reading and mathematics knowledge and skills).

This report presents a simple picture of the gains children are making across the kindergarten year. The ECLS-K will follow these children through the fifth grade. We will be able to track children's performance and the differences in their performance, not only by child and family characteristics but also by teacher and school characteristics. This report represents only the beginning of understanding the role of the kindergarten year in children's development. Future analyses, based on the information from the ECLS-K, will help us understand the role of such things as child care, home educational environment, teachers' instructional practices, class size and the general climate, facilities, and safety of the schools.

Methodology and Technical Notes

Survey Methodology

The Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), is being conducted by Westat for the U.S. Department of Education, National Center for Education Statistics (NCES). It is designed to provide detailed information on children's early school experiences. The study began in the fall of the 1998–99 school year. The children participating in the ECLS-K are being followed longitudinally through the fifth grade. Estimates in this report are based on children entering kindergarten for the first time in the fall of 1998.

Sample Design

A nationally representative sample of 22,782 children enrolled in 1,277 kindergarten programs during the 1998–99 school year were sampled to participate in the ECLS-K. The children attended both public and private kindergartens that offered full-day and part-day programs. The sample includes children from different racial/ethnic and socioeconomic backgrounds, and includes oversamples of Asian children, private kindergartens, and private kindergartners.

Sampling for the ECLS-K involved a dual-frame, multistage sampling design. The first stage of sampling involved the selection of 100 primary sampling units (PSU) from a national sample of PSUs. The PSUs were counties and county groups. Public and private schools were then selected within the PSUs, and children were sampled from the selected schools. Public schools were selected from the Common Core of Data, a public school frame, and private schools were selected from a private school frame developed from the Private School Survey.[15] Approximately 23 kindergartners were selected on average in each of the sampled schools.

[15] During the spring of 1998, Westat identified new schools that were not found on either frame. A sample of these schools was included in the ECLS-K school sample.

Fall kindergarten data were obtained from September to December 1998. Spring kindergarten data were obtained from March to June 1999.

Response Rates

A total of 944 of the 1,277 originally sampled schools participated during the base year of the study. This translates into a weighted response rate of 74 percent for the base year of the study. The school response rate during the spring of the base year (74.2 percent) was higher than during the fall (69.4 percent), due to some of the schools that originally declined to participate changing their minds and participating in the spring. Nearly all (99.4 percent) of the schools that participated in the fall of the base year also participated in the spring.

The child base-year completion rate was 92 percent, i.e., 92 percent of the children were assessed at least once during kindergarten. The parent base-year completion rate was 89 percent (i.e., a parent interview was completed at least once during kindergarten). Thus, the overall base-year response rate for children was 68.1 percent (74 percent x 92 percent) and the base-year response rate for the parent interview was 65.9 percent (74 percent x 89 percent). About 95 percent of the children and 94 percent of the parents who participated in the fall of kindergarten also participated in the spring.

A nonresponse bias analysis was conducted to determine if substantial bias is introduced due to school nonresponse. Five different approaches were used to examine the possibility of bias in the ECLS-K sample. First, weighted and unweighted response rates for schools, children, parents, teachers, and school administrators were examined to find large response rate differences by characteristics of schools (e.g., urbanicity, region, school size, percent minority, and grade range) and children (e.g., sex, age, race/ethnicity). Second, estimates based on the ECLS-K respondents were compared to estimates based on the full sample. The distributions of schools by school type, urbanicity, region, and the distributions of enrollment by kindergarten type (public versus private), race/ethnicity, urbanicity, region and eligibility for free and reduced-price lunch were compared for the responding schools and all the schools on the sampling frame. Third, estimates from the ECLS-K were compared with estimates from other data sources (e.g., Current Population Survey, National Household Education Survey, Survey of Income and Program Participation). Fourth, estimates using the

ECLS-K unadjusted weights were compared with estimates using the ECLS-K weights adjusted for nonresponse. Large differences in the estimates produced with these two different weights would indicate the potential for bias after nonresponse adjustments. Fifth, and last, simulations of nonresponse were conducted. The results of these analyses are summarized in the *ECLS-K User's Manual* and reported in detail in the *ECLS-K Methodology Report*. Findings from these analyses suggest that there is not a bias due to school nonresponse.

Data Reliability

Estimates produced using data from the ECLS–K are subject to two types of error, sampling and nonsampling errors. Nonsampling errors are errors made in the collection and processing of data. Sampling errors occur, because the data are collected from a sample rather than a census of the population. A detailed discussion of these types of errors can be found in *America's Kindergartners* (West et al. 2000).

Standard Errors and Weights

In order to produce national estimates from the ECLS-K data collected during the fall and spring of the 1998–99 school year, the sample data were weighted. Weighting the data adjusts for unequal selection probabilities at the school and child levels and adjusts for school, child, teacher, and parent nonresponse. The first stage of the weighting process assigns weights to the sampled primary sampling units (PSUs) equal to the inverse of the PSU probability of selection.[16] The second stage of the weighting process assigns weights to the schools sampled within PSUs. The base weight for each sampled school is the PSU weight multiplied by the inverse of the probability of selecting the school. The base weights for eligible schools are adjusted for nonresponse. These adjustments are made separately for public and private schools.

The base weight for each child in the sample is the school nonresponse adjusted weight for the school the child attends, multiplied by a post-stratified within-school student weight

[16] The approach used to develop weights for the ECLS-K is described in the *ECLS-K User's Manual* and the *ECLS-K Methodology Report*

(total number of students in the school, divided by the number of students sampled in the school). The child-parent panel weight (BYCOMW0), which is the weight used to produce the estimates found in this report, is the base child weight adjusted for nonresponse to the parent interview at each round of data collection. Only those cases with completed child assessments in both fall and spring of kindergarten are included in these weighting procedures. Again, these adjustments are made separately for public and private schools.

In addition to properly weighting the responses, special procedures for estimating the statistical significance of the estimates were employed, because the data were collected using a complex sample design. Complex sample designs, like that used in the ECLS-K, result in data that violate the assumptions that are normally required to assess the statistical significance of the results. Frequently, the standard errors of the estimates are larger than would be expected, if the sample was a simple random sample and the observations were independent and identically distributed random variables. WesVarPC was used in this analysis to calculate standard errors.

Replication methods of variance estimation were used to reflect the actual sample design used in the ECLS-K. A form of the jackknife replication method (JK2) using 90 replicates was used to compute approximately unbiased estimates of the standard errors of the estimates in the report. The jackknife methods were used to estimate the precision of the estimates of the reported national percentages and means.

Statistical Procedures

Comparisons made in the text were tested for statistical significance to ensure that the differences are larger than might be expected due to sampling variation. For reference, standard errors for tables 2 and 3 are included in the appendix.

When comparisons in estimates at one point in time (e.g., fall kindergarten) were made between categorical groups (i.e., gender, race/ethnicity, school type and program type), *t* statistics were calculated. The formula used to compute the *t* statistic was:

$$t = Est_1 - Est_2 / SQRT[(se_1)^2 + (se_2)]^2$$

Where Est_1 and Est_2 are the estimates being compared and se_1 and se_2 are their corresponding standard errors.

When comparing the gains of groups of children on the social rating scale items where frequencies are reported (e.g., change in the frequency with which males persist at tasks versus change in the frequency with which females persist at tasks), the following formula was used:

$$t = (Est_{11} - Est_{21}) - (Est_{12} - Est_{22}) / SQRT[(se_{11}^2 + se_{21}^2) + (se_{12}^2 + se_{22}^2)]$$

Where Est_{11} and Est_{21} are the estimates being compared within a category (e.g., male fall reading and male spring reading) and Est_{12} and Est_{22} are the estimates being compared within the other category (e.g., female fall reading score, female spring reading score). And se_{11}, se_{21}, se_{12}, and se_{22} are their corresponding standard errors.

To guard against errors of inference based on multiple comparisons, the Bonferroni procedure to correct significance tests for multiple contrasts was used in this report. The Bonferroni procedure divides the alpha level for a single t test (e.g., .05) by the number of critical pairwise comparisons, in order to provide a new alpha that adjusts for the number of comparisons being made.

When comparisons with continuous or ordinal independent variables were made (i.e., age at entry, mother's education, and the risk index), regression analysis was used. When the analyses involved continuous dependent variables—all of the cognitive scores—linear regression was used; with dichotomous dependent variables—social skills, problem behaviors, and approaches to learning—logistic regression was used.

Constructs and Variables Used in Analysis

Children's Cognitive Knowledge and Skills

The ECLS-K direct child cognitive assessment was administered using a computer-assisted personal interview (CAPI), administered one-on-one with each child. The assessment included two cognitive domains (reading and mathematics). The ECLS-K battery was a two-stage assessment approach, in which the first stage in each domain contained a routing test that determined a child's approximate skills. According to the child's performance on the routing test, the child was administered the appropriate skill level assessment for that domain (the second stage). The reading and mathematics assessments had three skill levels. Children were administered the routing stage and the appropriate skill level stage in the fall of kindergarten, and again in the spring of kindergarten.

To be sensitive to the needs and capabilities of the children in the sample, an English language proficiency screener, called the Oral Language Development Scale (OLDS), was administered if school records indicated that the child's home language was not English. The child had to demonstrate a certain level of English proficiency to be administered the cognitive assessment in English. In terms of first-time kindergartners, about 93 percent were assessed in English in the fall of kindergarten. The 7 percent of children excluded from the English assessment represents 19 percent of the Asian children and 29 percent of the Hispanic children. The cognitive knowledge and skills estimates in this report are based on those first-time kindergartners who were assessed in English in both the fall and the spring of kindergarten, therefore the 7 percent of children who were excluded from the English assessment in the fall of kindergarten were not included. Less than .5 percent of children in the fall and the spring of kindergarten were excluded from the assessment based on a disability.

Scale score. Item Response Theory (IRT) was employed to calculate scores that could be compared regardless of which second stage form a student took. The items in the routing test, plus a core set of items shared among the different second stage forms, made it possible to establish a common scale. IRT uses the pattern of right, wrong, and omitted responses to the items actually administered in a test, and the difficulty, discriminating ability, and "guess-

ability" of each item, to place each student on a continuous ability scale. It is then possible to estimate the score the student would have achieved if all of the items in all of the test forms had been administered. The reliability of the estimates of reading and mathematics, fall and spring scores, are as follows (IRT-based theta): reading = .9, mathematics = .9.

Proficiency Level Probability Scores. Proficiency scores provide a means of distinguishing status or gain in specific skills within a content area from the achievement measured by the IRT scale scores. Clusters of four test questions having similar content and difficulty were included at several points along the score scale of the reading and mathematics tests. A student was assumed to have mastered a particular level of proficiency, if at least three of the four items in the cluster were answered correctly, and to have failed at this level, if two or more items were wrong. Clusters of items provide a more reliable test of proficiency than do single items, because of the possibility of guessing. It is very unlikely that a student who has not mastered a particular skill would be able to guess enough answers correctly to pass a four item cluster. These scores are computed using performance in each subject. The nature of the two-stage test is that not all children receive all items. To calculate proficiency estimates for all children, an IRT model was employed. For the purpose of IRT calibration, the item clusters were treated as single items. The hierarchical nature of the skill sets justified the use of the IRT model in this way. Gains in probability of mastery at each proficiency level allow researchers to study not only the amount of gain in total scale score points but also where along the scale different children are making their largest gains in achievement during a particular time interval.

In reading, the proficiency levels are named as follows: (1) letter recognition, (2) beginning sounds, (3) ending sounds, (4) sight words, and (5) words in context. *Letter recognition* is as it sounds—the ability of children to recognize their letters. *Beginning sounds* and *ending sounds* refer to children's ability to understand the letter-sound relationship at the beginning and at the ending of words. *Sight words* refer to children's ability to recognize whole words by sight and read them aloud. And, *words in context* refer to children's ability to read simple short passages of text with a missing word, and insert the correct missing word.

In mathematics, the proficiency levels are named as follows (their names reflect the most complex mathematical construct contained in the proficiency): (1) number and shape, (2) relative size, (3) ordinality and sequence, (4) add/ subtract, and (5) multiply/divide. *Number and shape* refers to children's ability to recognize single-digit numbers and basic shapes. *Relative size* refers to children's ability to count beyond 10, recognize the sequence in basic patterns, and compare the relative size of objects. *Ordinality and sequence* means that children can recognize two-digit numbers, identify the next number in a sequence, and identify the ordinal position of an object. *Addition and subtraction* means children can perform simple addition and subtraction problems. *Multiplication and division* refers to children's ability to perform simple multiplication and division operations. The addition, subtraction, multiplication and division items are presented in the form of word problems with picture support and in numerical statements.

Children's Social Knowledge and Skills

All kindergarten teachers with sampled children in their classrooms were asked to fill out three self-administered questionnaires. The first two pertained to their own educational backgrounds, teaching practices, experiences, and the classroom settings where they taught. For each of the sampled children they taught, the teachers also completed a child-specific questionnaire that collected information on the child's social knowledge and skills. Teachers reported on the frequency with which children demonstrated particular behaviors (e.g., accept peer ideas, fight with others, persist at tasks). Teachers rated the frequency of children's behaviors as *never*, *sometimes*, *often*, or *very often*. To present the behaviors in terms of their basic frequency (e.g., frequent versus infrequent), the categories were collapsed into *never sometimes* and *often very often*.

Family and Child Characteristics

Parents/guardians were asked to provide key information about their children on subjects such as family demographics (e.g., age, relation to child, race/ethnicity), family structure (household members and composition), parent involvement, home educational activities, child care experience, child health, parental education and employment status, and child's social skills and behaviors. Most of the data were collected through a computer-assisted

telephone interviewing (CATI), though some of the interviews were collected through a computer-assisted personal interviewing (CAPI), when respondents did not have a telephone or were reluctant to be interviewed by telephone.

Derived Variables

A number of variables used in this report were derived by combining information from one or more questions in the ECLS-K parent questionnaire or from other study sources. The derivation of key variables is described in this section.

Children's age at entry to kindergarten. This variable was constructed using two variables: month and year of birth. These variables were combined to form five categories: children born prior to September 1992 (age 6 when they entered kindergarten), born between September–December 1992 (turning age 6 when they entered kindergarten), January–April 1993 (age 5 when they entered kindergarten), May–August 1993 (age 5 when they entered kindergarten) and September–December 1993 (age 4 when they entered kindergarten).

Maternal education. This variable was constructed using the questions on the highest grade the child's mother or female guardian had completed, and whether the mother or female guardian had obtained a high school equivalency degree if she did not complete high school. This information was collapsed into four categories: less than high school, high school or equivalent, some college including vocational/technical training, and bachelor's degree or higher.

Children's race/ethnicity. The race/ethnicity composite was constructed from two parent-reported variables: ethnicity and race. New Office of Management and Budget guidelines were followed under which a respondent could select more than one race. Thus each respondent had to identify whether the child was Hispanic, and then select one or more races. The following are the five composite race/ethnicity categories we present in this report: white non-Hispanic, black non-Hispanic, Hispanic, Asian and Other (which includes Pacific Islanders, American Indians, Alaska Natives, and multiracial children). When race/ethnicity

differences are presented in this report, white refers to white, non-Hispanic and black refers to black, non-Hispanic.

Risk factor index. The risk factor index uses information on the following family characteristics: mother with less than a high school diploma, family utilized AFDC and/or food stamps, single parent family, and primary language other than English (as identified by the respondent in the parent interview). The index is a cumulative count of the individual factors, with each factor counting as 1. The cumulative count was collapsed into: 0, 1, and 2 or more—meaning the presence of none of the risk factors, the presence of one of the risk factors, or the presence of 2 or more of the risk factors.

School type. The type of school in which children attended kindergarten was collapsed into two broad categories: public and private. Private schools include those with both religious affiliations and nonreligious affiliations. Information from the school administrator questionnaire, along with school sample frame data, was used to create this variable. If there was no school administrator questionnaire, then school sample frame data were used to create the composite.

Kindergarten program type. This report refers to two types of kindergarten programs: full day and part day. This variable was constructed from information provided by teachers on the time(s) of day that they taught kindergarten (e.g., AM only, PM only, AM and PM, all day). Children whose teachers reported teaching AM only, PM only, or both AM and PM classes were classified as part day, and children whose teachers reported teaching all-day kindergarten classes were classified as full day. In cases where the information provided by the teachers was inconsistent (e.g., teachers who reported that they taught AM only classes and all-day classes, information from the field management system that was used by field staff to schedule in-school child assessments) was used to resolve the inconsistency.

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Tables

Table 1.—Population percentages of first-time kindergartners: 1998–99

Characteristic	Population percentage
Total	100
Child's sex	
Male	51
Female	49
Child's age at entry	
Age 4: Born Sep.—Dec. 1993	9
Age 5: Born May—Aug. 1993	32
Age 5: Born Jan.—Apr. 1993	32
Age 6: Born Sep.—Dec. 1992	24
Age 6: Born Jan.—Aug. 1992	4
Mother's education	
Less than high school	15
High school diploma or equivalent	31
Some college[1]	32
Bachelor's degree or higher	22
Child's race/ethnicity	
White, non-Hispanic	58
Black, non-Hispanic	15
Asian	3
Hispanic	19
Other	5
Risk index[2]	
0 risk factors	60
1 risk factor	25
2 or more risk factors	15
School type	
Public	85
Private	15
Program type	
All day	55
Part day	45

[1]Some college includes vocational and technical education.
[2]Risk index consists of a non-English primary home language, single-parent family, less than high school maternal education, and the family having received welfare assistance.
NOTE: Detail may not sum to totals due to rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

Table 2.—First-time kindergartners' reading and mathematics mean scale scores, by child, family, and kindergarten program characteristics: Fall 1998 to spring 1999

Characteristic	Reading			Mathematics		
	Fall	Spring	Change	Fall	Spring	Change
Total	22	32	10	20	28	8
Child's sex						
Male	21	31	10	20	28	8
Female	23	33	10	20	28	8
Child's age at entry						
Age 4: Born Sep.—Dec. 1993	20	29	9	17	24	7
Age 5: Born May—Aug. 1993	21	31	10	18	26	8
Age 5: Born Jan.—Apr. 1993	22	33	10	20	28	8
Age 6: Born Sep.—Dec. 1992	24	34	10	22	30	9
Age 6: Born Jan.—Aug. 1992	25	34	10	24	32	8
Mother's education						
Less than high school	17	26	9	15	23	7
High school diploma or equivalent	20	30	10	18	26	8
Some college[1]	22	33	10	20	28	8
Bachelor's degree or higher	27	37	10	24	33	9
Child's race/ethnicity						
White, non-Hispanic	23	33	10	21	30	9
Black, non-Hispanic	20	29	9	17	24	7
Asian	26	38	12	23	31	9
Hispanic	19	30	11	17	25	8
Other	20	29	9	17	25	8
Risk index[2]						
0 risk factors	24	34	10	21	30	9
1 risk factor	20	30	10	18	26	8
2 or more risk factors	18	27	9	15	23	7
School type						
Public	21	31	10	19	27	8
Private	26	36	10	23	31	8
Program type						
All day	22	33	10	20	28	9
Part day	22	31	10	20	28	8

* Less than .5 percent.

[1]Some college includes vocational and technical education.

[2]Risk index consists of a non-English primary home language, single-parent family, less than high school maternal education, and the family having received welfare assistance.

NOTE: Due to rounding, spring scores minus fall scores may not equal the change score. Estimates are based on first-time kindergartners who were assessed in English in both the fall and the spring (approximately 19 percent of Asian children and approximately 30 percent of Hispanic children are not included in these estimates). In the table heading, Spr = spring and Ch = change from fall to spring.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

Table 3.—Percentage of first-time kindergartners demonstrating specific reading knowledge and skills, by child, family, and kindergarten program characteristics: Fall 1998 to spring 1999

Characteristic	Letter recognition			Beginning sounds			Ending sounds			Sight words			Words in context		
	Fall	Spr	Ch	Fall	Spr	Ch	Fall	Spr	Ch	Fall	Spr	Ch	Fall	Spr	Ch
Total	65	94	29	29	72	42	17	52	35	2	13	11	1	4	3
Child's sex															
Male	61	92	31	26	68	42	15	48	34	3	12	9	1	4	3
Female	69	95	26	32	76	43	18	56	37	2	15	12	1	5	4
Child's age at entry															
Age 4: Born Sep.—Dec. 1993	57	89	32	21	61	40	11	40	30	1	9	7	1	3	2
Age 5: Born May—Aug. 1993	60	93	33	24	67	43	13	47	34	1	10	9	1	3	3
Age 5: Born Jan.—Apr. 1993	66	94	28	31	73	43	17	54	37	2	13	11	1	4	3
Age 6: Born Sep.—Dec. 1992	72	96	24	36	78	42	22	59	37	4	17	13	2	6	5
Age 6: Born Jan.—Aug. 1992	75	96	21	39	77	39	25	59	35	4	18	14	2	6	4
Mother's education															
Less than high school	38	84	46	9	49	40	4	29	25	(*)	3	3	(*)	1	1
High school diploma or equivalent	57	92	34	21	66	45	11	45	34	1	9	8	(*)	2	2
Some college[1]	68	95	27	30	75	44	17	55	38	2	13	11	1	4	3
Bachelor's degree or higher	84	99	14	49	86	37	31	69	38	6	24	18	2	9	7
Child's race/ethnicity															
White, non-Hispanic	71	96	25	34	77	43	20	57	38	3	15	12	1	5	4
Black, non-Hispanic	57	90	33	20	59	40	10	39	29	1	8	7	(*)	2	2
Asian	79	98	20	43	85	42	28	68	40	9	29	20	5	14	9
Hispanic	50	90	40	20	65	45	11	45	34	1	10	8	(*)	3	2
Other	51	89	38	21	61	39	12	41	29	2	9	7	1	3	2
Risk index[2]															
0 risk factors	73	96	23	36	78	42	21	59	38	3	16	13	1	5	4
1 risk factor	57	91	34	21	65	44	11	44	33	2	9	8	1	3	2
2 or more risk factors	40	85	45	11	51	40	5	31	25	1	4	4	(*)	1	1
School type															
Public	62	93	31	26	70	43	15	49	34	2	11	9	1	4	3
Private	82	97	15	45	83	38	28	66	38	5	22	17	2	8	6
Program type															
All day	66	94	28	30	73	43	17	54	37	3	15	12	1	5	4
Part day	64	93	29	28	70	41	16	50	34	2	11	9	1	4	3

* Less than .5 percent.

[1]Some college includes vocational and technical education.

[2]Risk index consists of a non-English primary home language, single-parent family, less than high school maternal education, and the family having received welfare assistance.

NOTE: Due to rounding, spring scores minus fall scores may not equal the change score. Estimates are based on first-time kindergartners who were assessed in English in both the fall and the spring (approximately 19 percent of Asian children and approximately 30 percent of Hispanic children are not included in these estimates). In the table heading, Spr = spring and Ch = change from fall to spring.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

Table 4.—Percentage of first-time kindergartners demonstrating specific mathematics knowledge and skills, by child, family, and kindergarten program characteristics: Fall 1998 to spring 1999

Characteristic	Number & shape			Relative size			Ordinality, sequence			Add/subtract			Multiply/divide		
	Fall	Spr	Ch	Fall	Spr	Ch	Fall	Spr	Ch	Fall	Spr	Ch	Fall	Spr	Ch
Total	93	99	6	57	87	30	21	56	36	4	18	14	(*)	2	2
Child's sex															
Male	92	99	6	55	86	31	22	56	34	4	19	14	1	3	2
Female	94	99	5	58	87	30	20	57	37	3	17	14	(*)	2	1
Child's age at entry															
Age 4: Born Sep.—Dec. 1993	88	98	10	41	78	37	10	39	29	1	9	8	(*)	1	1
Age 5: Born May—Aug. 1993	91	99	8	49	84	35	15	50	35	2	13	11	(*)	1	1
Age 5: Born Jan.—Apr. 1993	94	99	5	59	88	29	21	59	37	4	18	15	(*)	2	2
Age 6: Born Sep.—Dec. 1992	96	100	4	66	91	25	30	67	37	6	25	19	1	4	3
Age 6: Born Jan.—Aug. 1992	97	99	2	73	91	18	38	70	32	9	31	21	2	6	5
Mother's education															
Less than high school	83	97	14	31	72	41	6	32	26	1	6	6	(*)	1	1
High school diploma or equivalent	91	99	8	48	83	35	14	49	35	2	13	11	(*)	1	1
Some college[1]	95	99	4	59	89	30	21	59	38	3	18	14	(*)	2	2
Bachelor's degree or higher	99	100	1	76	95	19	38	75	37	9	31	23	1	5	4
Child's race/ethnicity															
White, non-Hispanic	96	99	4	64	91	27	26	64	38	5	22	17	(*)	3	3
Black, non-Hispanic	89	98	9	41	76	35	9	37	28	1	8	7	(*)	(*)	(*)
Asian	97	100	3	68	92	24	32	68	36	9	28	19	1	6	5
Hispanic	90	99	9	43	81	38	12	46	33	2	12	10	(*)	1	1
Other	88	99	11	45	81	37	13	45	32	2	11	9	(*)	1	1
Risk index[2]															
0 risk factors	96	99	4	65	91	26	27	64	37	5	22	17	(*)	3	3
1 risk factor	91	99	8	47	82	35	14	48	34	2	13	11	(*)	1	1
2 or more risk factors	84	97	14	33	72	39	7	32	25	1	6	5	(*)	(*)	(*)
School type															
Public	92	99	7	54	85	32	19	54	35	3	16	13	(*)	2	2
Private	97	100	2	72	93	22	33	70	37	7	27	20	1	4	3
Program type															
All day	93	99	6	56	87	31	21	57	37	4	19	15	(*)	2	2
Part day	94	99	6	57	86	29	21	55	34	4	17	13	(*)	2	2

* Less than .5 percent.

[1]Some college includes vocational and technical education.

[2]Risk index consists of a non-English primary home language, single-parent family, less than high school maternal education, and the family having received welfare assistance.

NOTE: Due to rounding, spring scores minus fall scores may not equal the change score. Estimates are based on first-time kindergartners who were assessed in English in both the fall and the spring (approximately 19 percent of Asian children and approximately 30 percent of Hispanic children are not included in these estimates). In the table heading, Spr = spring and Ch = change from fall to spring.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999

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Table 5.—Percentage of first-time kindergartners demonstrating specific prosocial behaviors, by child, family, and kindergarten program characteristics: Fall 1998 to spring 1999

Characteristic	Accept peer ideas			Form friendships			Comfort others		
	Fall	Spring	Change	Fall	Spring	Change	Fall	Spring	Change
Total	74	77	4	77	82	5	52	62	10
Child's sex									
Male	71	75	4	73	79	6	43	52	8
Female	77	80	3	81	84	4	61	72	11
Child's age at entry									
Age 4: Born Sep.—Dec. 1993	68	76	7	73	78	4	47	59	11
Age 5: Born May—Aug. 1993	73	76	3	74	80	6	50	60	9
Age 5: Born Jan.—Apr. 1993	75	78	3	77	83	6	53	63	11
Age 6: Born Sep.—Dec. 1992	75	79	4	80	83	3	55	64	8
Age 6: Born Jan.—Aug. 1992	75	78	3	78	81	3	55	63	8
Mother's education									
Less than high school	70	75	5	70	75	5	43	54	11
High school diploma or equivalent	73	77	4	75	80	5	51	61	11
Some college[1]	75	78	3	78	83	5	54	63	9
Bachelor's degree or higher	76	79	3	81	86	4	58	66	8
Child's race/ethnicity									
White, non-Hispanic	76	80	4	79	83	4	56	65	9
Black, non-Hispanic	68	69	1	72	75	3	45	53	8
Asian	75	82	6	74	86	12	52	63	11
Hispanic	73	77	5	74	82	8	47	59	12
Other	71	73	2	70	76	7	49	58	9
Risk index[2]									
0 risk factors	76	80	3	80	85	4	56	66	10
1 risk factor	71	75	4	72	78	5	48	57	9
2 or more risk factors	68	72	4	69	75	6	43	52	10
School type									
Public	73	77	4	76	81	5	51	61	10
Private	76	78	1	80	85	4	57	66	9
Program type									
All day	72	75	3	77	81	5	53	62	9
Part day	76	80	4	77	82	5	51	62	11

[1]Some college includes vocational and technical education.

[2]Risk index consists of a non-English primary home language, single-parent family, less than high school maternal education, and the family having received welfare assistance.

NOTE: Due to rounding, spring scores minus fall scores may not equal the change score. Estimates based on first-time kindergartners. Estimates based on teacher report of how frequently children demonstrate behavior; the ratings presented in this table are the percentage of children who demonstrate the behavior *often* or *very often*.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

Table 6.—Percentage of first-time kindergartners demonstrating specific problem behaviors, by child, family, and kindergarten program characteristics: Fall 1998 to spring 1999

Characteristic	Argue with others			Fight with others			Easily gets angry		
	Fall	Spring	Change	Fall	Spring	Change	Fall	Spring	Change
Total	11	13	2	8	8	(*)	10	9	-1
Child's sex									
Male	13	15	2	10	10	(*)	12	12	-1
Female	8	10	1	6	5	-1	7	6	-1
Child's age at entry									
Age 4: Born Sep.—Dec. 1993	11	13	2	9	7	-1	12	10	-2
Age 5: Born May—Aug. 1993	11	14	2	9	8	-1	11	10	(*)
Age 5: Born Jan.—Apr. 1993	10	11	1	8	7	-1	10	8	-1
Age 6: Born Sep.—Dec. 1992	10	12	2	7	8	1	9	8	(*)
Age 6: Born Jan.—Aug. 1992	11	12	2	8	8	(*)	11	9	-2
Mother's education									
Less than high school	12	14	2	11	9	-2	11	10	-2
High school diploma or equivalent	12	14	2	8	9	(*)	10	10	(*)
Some college[1]	10	13	3	7	7	(*)	10	9	(*)
Bachelor's degree or higher	9	9	(*)	6	6	-1	9	7	-2
Child's race/ethnicity									
White, non-Hispanic	10	11	1	7	6	-1	9	8	-1
Black, non-Hispanic	17	22	5	12	14	2	13	16	3
Asian	6	5	-1	5	4	-1	8	4	-4
Hispanic	9	10	1	9	7	-2	11	8	-3
Other	13	13	(*)	10	9	-1	11	11	-1
Risk index[2]									
0 risk factors	10	10	1	6	6	(*)	9	8	-1
1 risk factor	12	16	4	10	10	(*)	11	11	(*)
2 or more risk factors	13	16	3	11	11	(*)	12	12	-1
School type									
Public	11	13	2	8	8	-1	10	9	-1
Private	10	11	1	7	7	(*)	9	9	(*)
Program type									
All day	13	15	2	10	9	-1	11	11	(*)
Part day	8	9	(*)	7	6	-1	9	7	-2

* Less than .5 percent.

[1]Some college includes vocational and technical education.

[2]Risk index consists of a non-English primary home language, single-parent family, less than high school maternal education, and the family having received welfare assistance.

NOTE: Due to rounding, spring scores minus fall scores may not equal the change score. Estimates based on first-time kindergartners. Estimates based on teacher report of how frequently children demonstrate behavior, the ratings presented in this table are the percentage of children who demonstrate the behavior *often* or *very often*.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

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Table 7.—Percentage of first-time kindergartners demonstrating specific approaches to learning behaviors, by child, family, and kindergarten program characteristics: Fall 1998 to spring 1999

Characteristic	Persists at tasks			Seems eager to learn			Pays attention		
	Fall	Spring	Change	Fall	Spring	Change	Fall	Spring	Change
Total	71	75	4	75	79	3	66	70	4
Child's sex									
Male	65	69	4	72	75	3	58	62	4
Female	77	82	4	79	83	3	74	78	4
Child's age at entry									
Age 4: Born Sep.—Dec. 1993	62	67	5	67	73	6	56	62	6
Age 5: Born May—Aug. 1993	65	70	4	71	75	4	61	65	4
Age 5: Born Jan.—Apr. 1993	73	77	4	78	80	3	68	72	4
Age 6: Born Sep.—Dec. 1992	78	81	4	81	83	3	73	75	2
Age 6: Born Jan.—Aug. 1992	81	79	-2	81	83	3	72	73	1
Mother's education									
Less than high school	60	64	4	63	68	5	54	59	6
High school diploma or equivalent	69	72	3	73	76	4	64	66	2
Some college[1]	73	77	4	78	81	3	68	71	3
Bachelor's degree or higher	79	84	5	84	87	2	75	79	4
Child's race/ethnicity									
White, non-Hispanic	75	78	4	79	82	3	70	73	3
Black, non-Hispanic	61	65	4	66	69	3	56	59	3
Asian	81	89	8	82	88	6	70	80	10
Hispanic	67	72	5	72	76	4	62	68	6
Other	68	72	4	72	76	4	61	64	3
Risk index[2]									
0 risk factors	76	80	4	81	83	3	72	75	3
1 risk factor	68	71	4	70	75	4	61	65	4
2 or more risk factors	58	63	4	64	67	3	53	58	5
School type									
Public	70	74	4	74	78	4	65	69	3
Private	77	80	3	81	83	2	70	75	5
Program type									
All day	69	72	3	75	78	3	64	67	3
Part day	73	78	5	76	80	4	68	73	4

[1]Some college includes vocational and technical education.

[2]Risk index consists of a non-English primary home language, single-parent family, less than high school maternal education, and the family having received welfare assistance.

NOTE: Due to rounding, spring scores minus fall scores may not equal the change score. Estimates based on first-time kindergartners. Estimates based on teacher report of how frequently children demonstrate behavior; the ratings presented in this table are the percentage of children who demonstrate the behavior *often* or *very often*.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

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Appendices

Table 2a.—Standard errors for first-time kindergartners' reading and mathematics mean by child, family, and kindergarten program characteristics: Fall 1998 to spring 1999

Characteristic	Reading			Mathematics		
	Fall	Spring	Change	Fall	Spring	Change
Total	0.16	0.22	0.13	0.14	0.19	0.09
Child's sex						
Male	0.17	0.22	0.15	0.17	0.21	0.10
Female	0.18	0.26	0.13	0.15	0.20	0.11
Child's age at entry						
Age 4: Born Sep.—Dec. 1993	0.27	0.36	0.21	0.22	0.29	0.16
Age 5: Born May—Aug. 1993	0.18	0.28	0.18	0.15	0.22	0.13
Age 5: Born Jan.—Apr. 1993	0.19	0.25	0.13	0.15	0.20	0.11
Age 6: Born Sep.—Dec. 1992	0.24	0.26	0.18	0.23	0.27	0.13
Age 6: Born Jan.—Aug. 1992	0.41	0.53	0.35	0.36	0.44	0.32
Mother's education						
Less than high school	0.18	0.28	0.22	0.18	0.28	0.18
High school diploma or equivalent	0.17	0.24	0.17	0.14	0.22	0.12
Some college[1]	0.19	0.25	0.14	0.15	0.17	0.11
Bachelor's degree or higher	0.22	0.28	0.17	0.20	0.23	0.13
Child's race/ethnicity						
White, non-Hispanic	0.20	0.24	0.15	0.17	0.20	0.11
Black, non-Hispanic	0.28	0.39	0.22	0.21	0.29	0.17
Asian	0.63	0.63	0.34	0.49	0.53	0.32
Hispanic	0.29	0.43	0.31	0.22	0.32	0.22
Other	0.88	1.00	0.23	0.74	0.72	0.19
Risk index[2]						
0 risk factors	0.19	0.22	0.14	0.15	0.18	0.1
1 risk factor	0.21	0.28	0.15	0.17	0.25	0.13
2 or more risk factors	0.21	0.29	0.23	0.19	0.27	0.15
School type						
Public	0.15	0.23	0.15	0.14	0.21	0.11
Private	0.42	0.48	0.23	0.32	0.34	0.15
Program type						
All day	0.25	0.36	0.19	0.22	0.30	0.13
Part day	0.23	0.27	0.14	0.22	0.27	0.11

[1]Some college includes vocational and technical education.

[2]Risk index consists of a non-English primary home language, single-parent family, less than high school maternal education, and the family having received welfare assistance.

NOTE: In the table heading, Spr = spring and Ch = change from fall to spring.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Fall 1998 and Spring 1999.

Table 3a.—Standard errors for percentage of first-time kindergartners demonstrating specific reading knowledge and skills, by child, family, and kindergarten program characteristics: Fall 1998 to spring 1999

Characteristics	Letter recognition			Beginning sounds			Ending sounds			Sight words			Words in context		
	Fall	Spr	Ch	Fall	Spr	Ch	Fall	Spr	Ch	Fall	Spr	Ch	Fall	Spr	Ch
Total	0.73	0.35	0.56	0.74	0.82	0.62	0.51	0.86	0.61	0.13	0.45	0.41	0.07	0.19	0.16
Child's sex															
Male	0.83	0.44	0.69	0.75	0.87	0.69	0.50	0.85	0.66	0.16	0.44	0.37	0.09	0.21	0.18
Female	0.85	0.38	0.67	0.89	0.93	0.71	0.64	0.98	0.66	0.15	0.60	0.54	0.08	0.24	0.21
Child's age at entry															
Age 4: Born Sep.—Dec. 1993	1.60	1.00	1.28	1.06	1.38	1.06	0.72	1.28	0.96	0.29	0.80	0.72	0.17	0.39	0.36
Age 5: Born May—Aug. 1993	0.97	0.44	0.82	0.78	1.07	0.92	0.52	1.08	0.87	0.17	0.58	0.50	0.09	0.28	0.23
Age 5: Born Jan.—Apr. 1993	0.92	0.48	0.74	0.91	0.95	0.71	0.63	0.97	0.67	0.23	0.54	0.47	0.13	0.27	0.21
Age 6: Born Sep.—Dec. 1992	1.04	0.42	0.99	1.11	0.86	0.98	0.84	0.97	0.81	0.29	0.69	0.58	0.20	0.39	0.29
Age 6: Born Jan.—Aug. 1992	1.95	0.88	1.83	1.77	1.42	1.71	1.34	1.70	1.41	0.71	1.53	1.29	0.55	0.97	0.69
Mother's education															
Less than high school	1.39	0.62	1.17	1.38	0.35	1.26	1.09	0.09	1.05	0.34	0.03	0.33	0.10	0.85	0.08
High school diploma or equivalent	0.98	0.57	0.83	0.80	1.03	0.92	0.52	0.96	0.80	0.14	0.44	0.40	0.08	0.20	0.17
Some college[1]	0.93	0.41	0.78	0.90	0.92	0.82	0.63	0.95	0.70	0.23	0.62	0.54	0.12	0.29	0.24
Bachelor's degree or higher	0.77	0.20	0.72	0.99	0.66	0.75	0.80	0.90	0.69	0.33	0.86	0.72	0.19	0.48	0.39
Child's race/ethnicity															
White, non-Hispanic	0.90	0.34	0.74	0.94	0.85	0.77	0.66	0.93	0.68	0.17	0.55	0.49	0.09	0.24	0.21
Black, non-Hispanic	1.40	0.85	1.06	1.24	1.59	1.03	0.83	1.45	0.99	0.26	0.75	0.66	0.12	0.30	0.24
Asian	1.84	0.48	1.72	2.28	1.45	1.76	1.83	1.76	1.48	1.32	1.83	1.45	0.85	1.28	0.85
Hispanic	1.66	0.91	1.43	1.24	1.64	1.38	0.76	1.68	1.37	0.23	0.80	0.77	0.14	0.32	0.26
Other	5.02	2.09	3.24	3.07	4.29	1.71	1.99	3.69	2.00	0.64	1.48	1.02	0.34	0.73	0.48
Risk index[2]															
0 risk factors	0.77	0.23	0.67	0.91	0.72	0.74	0.65	0.83	0.63	0.18	0.56	0.50	0.09	0.25	0.22
1 risk factor	1.14	0.61	0.89	0.86	1.14	0.80	0.56	1.09	0.75	0.19	0.49	0.40	0.11	0.23	0.18
2 or more risk factors	1.60	1.17	1.34	0.74	1.32	1.18	0.44	1.08	1.01	0.19	0.45	0.41	0.11	0.18	0.11
School type															
Public	0.74	0.40	0.57	0.72	0.91	0.70	0.49	0.93	0.69	0.12	0.45	0.41	0.07	0.17	0.15
Private	1.29	0.37	1.08	1.84	1.11	1.21	1.44	1.41	0.82	0.57	1.46	1.11	0.28	0.78	0.64
Program type															
All day	1.07	0.54	0.78	1.15	1.28	0.91	0.81	1.32	0.86	0.20	0.80	0.69	0.11	0.33	0.28
Part day	1.19	0.49	0.87	1.03	1.06	0.64	0.67	1.12	0.69	0.17	0.47	0.38	0.08	0.20	0.17

[1]Some college includes vocational and technical education.

[2]Risk index consists of a non-English primary home language, single-parent family, less than high school maternal education, and the family having received welfare assistance.

NOTE: In the table heading, Spr = spring and Ch = change from fall to spring.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99, Fall 1998 and Spring 1999.

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